The Journal

OF THE

BOARD OF AGRICULTURE

VOL. XII.

(April 1905 to March 1906.)

LONDON:
PRINTED AND PUBLISHED FOR HIS MAJESTY'S STATIONERY OFFICE
By LAUGHTON & CO., Limited, 3, Wellington Street, Strand, W.C.

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THE JOURNAL
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BOARD OF AGRICULTURE.

Vol. XII. No. 1.

APRIL, 1905. [NEW SERIES.]

GRAFTING FRUIT TREES.

Grafting or budding is not a difficult art to learn. The best way is to get a practical lesson, and then, before attempting anything with growing stocks, practice the various cuts and fittings with different sized pieces of wood.

To be successful in actual grafting the stocks must be in just the right condition, *i.e.*, with the sap flowing freely, the grafts nicely fresh and not shrivelled, and all cuts made very clean and fitting together exactly. It can easily be ascertained if the sap is right in the stock by cutting the latter off some little distance above where the grafting is to be done, making a slit in the bark and seeing if it parts freely from the wood. If this is not the case the grafts would not be likely to "take" and the operation must be postponed. To have the grafts fresh they should be left on the trees until there is a possibility of the buds beginning to burst. After cutting, tie neatly in bundles with the ends level, carefully label with name showing, and stand them in deepish drills in a shaded border, with soil made firm round the ends. They can also be kept fresh for some time by standing in a couple of inches of water in a dish in a cool room. To make the cuts clean a very sharp knife must be used, as the smoother the cuts the more quickly they heal.

The time for grafting various fruits depends very much on the earliness or otherwise of the season. With stone fruits we can sometimes commence in late March and early April, pears about the same time, and apples from the middle of April till the second week in May.

Preparation of Stocks.—It is generally better to purchase

stocks from firms who make a speciality of them and supply the trade, than to attempt to raise them. They are very cheap—not more than thirty-five shillings per thousand if bought in quantity. If only a few dozens or scores are wanted, it is as well to get them from the nearest reliable nurseryman. The soil for them must be trenched, either by turning soil and subsoil upside down, or by bastard trenching, when the subsoil is kept below and the soil on top. No manure should be applied where it would be under the roots, as it encourages downward rooting. The soil should be ready by the time the stocks can be obtained in early winter. When received, the stocks must be sorted to size, roots trimmed, and heads shortened to about two feet in length. Lay them with roots in soil to keep fresh, till they can be planted.

Plant in rows three feet apart, and one foot apart in rows, at the same depth as they had been previously. Cover the roots with a little soil and then apply manure to encourage lateral and surface rooting. Tread very firmly and keep lines quite straight, lightly forking over the soil afterwards to just loosen the surface. When sorting over, examine them very carefully for American blight,* and, if any is found, dress it with a little petroleum or train oil. In the summer, they must be examined for aphides,† and, if any are found, sprayed with a soft soap wash, made by dissolving 1 lb. soft soap in 10 gallons of soft water; extract of quassia chips may be added at the rate of about 12 ozs. of chips to 10 gallons of wash.

If the stocks do well, they should be ready for budding in August and September following, or grafting in the spring of the next year. The smaller ones may need another year's growth.

Kinds of Stocks.—For apples to be grown as standards, half-standards, or espaliers, the seedling apple and seedling crab, and for dwarf or bush trees, the English Paradise, are to be recommended, and for pears, the seedling pear and quince respectively. Plums are budded and grafted on the seedling plum and Myrobalan plum; they do well on the latter in the lias clays of Somerset, where the Myrobalan or "Cherry" plum fruits very freely. The Myrobalan also suits the apricot in

* See Leaflet No. 34. † See Leaflet No. 104.

those soils, and it is also worked on the Mussels and Brussels plums. For cherries, the Mahaleb and wild cherry are used, and for peaches and nectarines, the almond and plum. A batch of stocks can readily be raised by taking up suckers from various trees, but it is a bad practice, as they are prone to future suckering.

All stone fruits do better budded than grafted, there being a truer junction between bud and stock than obtains with grafts.

FIG I.—WHIP OR TONGUE GRAFTING.

The various methods of grafting can be seen from the illustrations.

Whip or Tongue Grafting.—This is most generally used on stocks about half an inch in diameter. The graft is prepared by taking off a slice on one side about $1\frac{1}{2}$ to 2 in. long, the upper end of the cut being opposite a bud, and the lower end cut away to nothing. The stock should have been cut off about 4 to 6 in from the soil. Place the graft against the stock to measure how long to make the cut on the latter, then shave off a slice of bark and wood just a little wider than the cut on the graft. This is necessary in order to make the two *inner* barks of graft and

stock fit together, and the bark of the former would be thinner than that of the latter. It is between these two inner barks that the union or junction is formed, the outer barks having practically nothing to do with it. The tongues in both must then be fitted together as shown and tied securely with bast or raffia and waxed over. Sometimes another small tongue is made in the stock at the bottom of the cut and the end of the graft tucked under it, as shown in Fig. 1, second branch from the left.

Saddle Grafting.—There are various ways of saddle grafting. The first (Fig. 2) may be used on stocks about three-quarters of

FIG. 2.—SADDLE GRAFTING.

an inch in diameter. This stock is made to an acute wedge shape by cutting off a slice on each side. Another cut on each side is made through the bark and a thin slice of wood. The graft is cut saddle shaped as shown by making a cut on each side of the the same length—about $1\frac{1}{2}$ to 2 in. Both cuts are rather thin till they reach the upper end opposite to a bud, then the knife slips in, and, when the second cut is made the bit of wood drops out. Place the graft in position across the wedged end of the stock, allowing the ends to go underneath the bark; then tie in and wax. In the illustration the tying is not finished or the cuts would have been hidden. Grafts made in this way take very well and soon grow over the stocks.

The next one (Fig. 3) is what may be termed the Somerset saddle, as it is more practised in that county than any other. It is a better and stronger method than the other, and can be used on stocks up to an inch thick. Sometimes it is done with even larger ones up to two inches thick, when two are put in on opposite sides, the end of the stock being cut square instead of on the slant. In both forms, making the cuts in the graft is an operation needing a good deal of skill and practice. In the one under notice the stock is prepared as shown by a longish

FIG. 3.—"SOMERSET" SADDLE GRAFTING.

cut on one side only. Then a slit is made in the bark on each side in just the same way as for bark grafting. If the sap is "up" the bark should part easily from the wood by giving the knife a bit of a twist on each side of the cuts. The first cut in the graft would be about an inch long and rather thick, or about half way through when it reaches the upper end to a bud. The other cut, to form the "strap," is double the length and thinner to allow for binding. At the upper end, when nearly opposite the first one, cut in at a more acute *angle*, when the wood should drop out. The short cut side goes under the bark on the top of the cut on the stock, the strap going across and under the bark on the other side; then tie and wax. If the graft takes properly

and the stock is not too wide it soon grows over the cut, and in a few years completely covers it.

In neither of these forms of saddles should the graft be split when preparing it, else when placed across the stock the split may run further up.

Crown or Rind Grafting.—This (Fig. 4) is the simplest of all, and mostly used on big branches of possibly oldish trees. The branches should be sawn off some few weeks before grafting time, and a few inches higher up than where they are to be grafted,

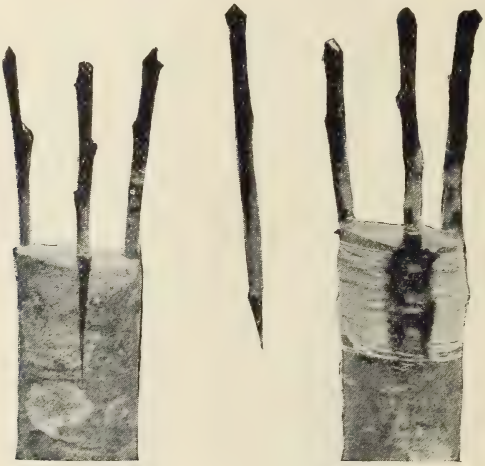

FIG. 4.—CROWN OR RIND GRAFTING.

to be cut off again just before the grafts are put on. Pare over the saw cut with a knife, then the bark soon heals over. If the branch is growing upright a slightly sloping cut must be made to allow water to run off.

Make a slit through the bark, and make it part from the wood either by twisting the knife or with a bit of bone or hard wood about the size of the graft. Cut a slice about two inches long off one side of the graft, the upper end of the cut being opposite a bud and the bottom cut away to nothing ; then slide the graft between the bark and the wood. By cutting a thin bit of bark off each side of the slit, it will return to its place next the wood. Several grafts can be put on in this way, each one being cut so that the leading buds point in opposite directions to grow away from each other. In all methods the grafts should be cut in such a way as to have a bud near the "collar" of the stock,

which *bud*, when it grows, will assist in forming a strong union. After tying, use just sufficient wax to cover and exclude air from the wounds or cuts.

Cleft or Wedge Grafting.—This is a very firm and sure method, but on rather large branches it is open to the objection that the moisture gathers in the cleft and decay commences in the wood. The branch is split with a hammer and chisel, the cleft being kept open with a wooden wedge. The sides of the cleft are pared smooth and straight, and the grafts cut wedge shaped and in-

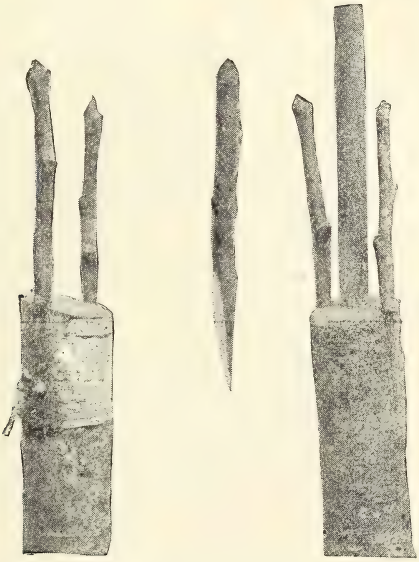

FIG. 5.—CLEFT OR WEDGE GRAFTING.

serted one on each side. The wooden wedge is removed, and the cleft, reducing in size, holds the grafts very firmly. Tying is hardly required, but it is safer to do it. Enough wax should be used to fill in and cover cleft and wounds as before.

Very soon after grafting time the buds and young branches will begin growing from the stocks. They should remain for a time to encourage the sap to circulate, and, when the grafts grow, be gradually reduced and finally removed altogether.

Wax and clay are used to exclude air from the wounds. Wax has been recommended throughout, as it is in many ways preferable to clay. It is much cleaner to use, can be more easily and quickly applied, and there is not the same shelter

under it for American blight. A good wax for using warm or cold can be made with equal parts by weight of Burgundy pitch, kerosene wax, and tallow (candles melted will do), or, as tallow smells rather strongly while being melted, olive oil may be preferred. They should be melted together in an old saucepan, and if used warm the mixture can be put on with a paint brush, or if cold with a putty knife. At the cost of not more than eighteenpence enough can be made for several hundreds of grafts.

Clay is cheaper, but cannot always be obtained ; it may be used in its natural state, according to the "temper" of the clay, or mixed with a third part of cow-dung. Cow-dung is also used alone, and also bands of hay and clay.

If the wax made as described is applied, it will remain fairly soft, and when the grafts grow well, about mid-summer, if a slit is made in the roffia both will be pushed off by the swelling of the grafts.

JOHN ETTLE.

SPRAYING MACHINES.*

The fruit-spraying machines in use in this country may be divided into four classes—knapsack, hand-power, horse-power, and steam- or oil-power. The machines to which reference is made below are mentioned as being representative of these various types.

There are at least three knapsack machines in the market—the Vermorel Eclair, Strawson's "Anti-pest," and one made by Weeks & Son, of Maidstone. Spraying machines of this type are suitable for small orchards, or for large ones of small trees and bushes. Work is much slower with them than with larger machines, as the volume of spray which they emit is slighter ; but there is a great convenience in the users being able to walk freely among trees and bushes, and being independent of assistance in refilling the vessels. They are not suitable for tall trees, however, except when fitted with extra long lances, and then their convenience is greatly diminished. Moreover, the strain on a

* It must be distinctly understood that the Board of Agriculture do not express any opinion as to the merits of any machine mentioned in this article, nor has any attempt been made to give a complete list of the spraying machines in the market.

man's back caused by the weight of the machine when full and the pressure of the pumping action is somewhat severe for a long day's work, and relief is apt to be sought by taking an unnecessary amount of time in the refillings, which are very frequent. For small orchards and trees and bushes in gardens, however, the knapsack machines are to be preferred to all others, not only

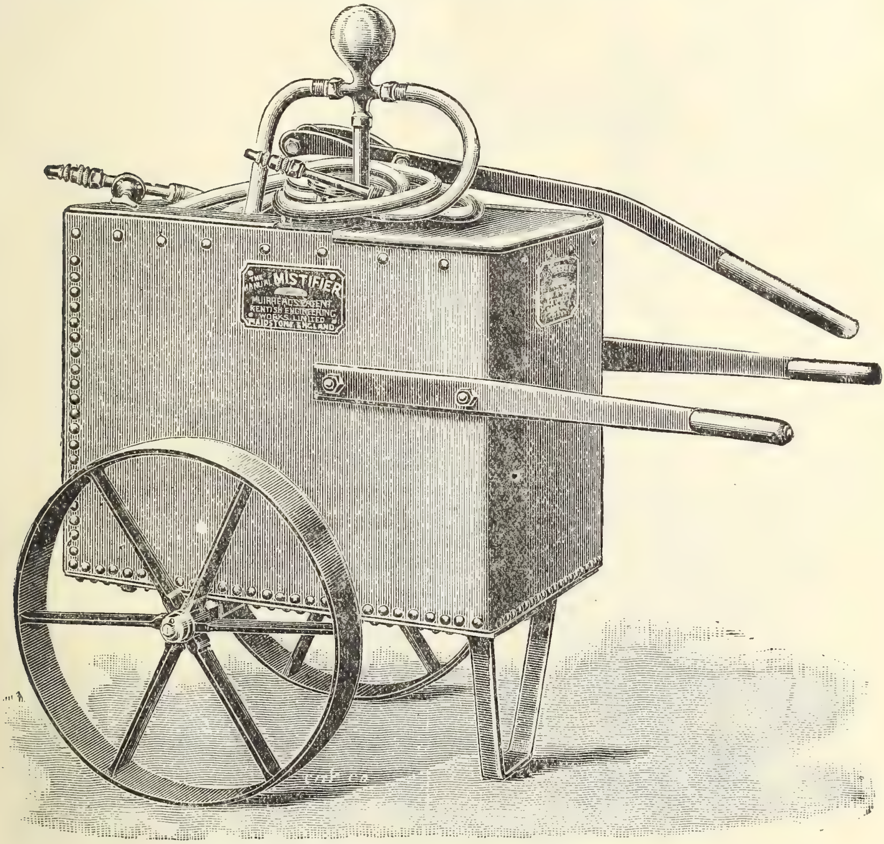

FIG. 1.—HAND-POWER SPRAYING MACHINE.

because of the convenience of getting about with them, but also because they are much less expensive, and can be used by one man.

There are several hand-power machines in the market, a few of which may be mentioned as examples. In connection with the Maidstone Show in 1899, the Royal Agricultural Society had a competitive trial of hop-spraying machines; but there has never been a similar trial of fruit sprayers in this country. The prize for the best hop sprayer was awarded to

Messrs. Drake & Fletcher, of Maidstone, for their horse-power "Mistifier." These manufacturers make a manual machine, to which they have given the same name, with a capacity of 30 to 110 gallons. All sizes have painted or galvanised tanks, containing pumps and agitators, and are mounted on two or three

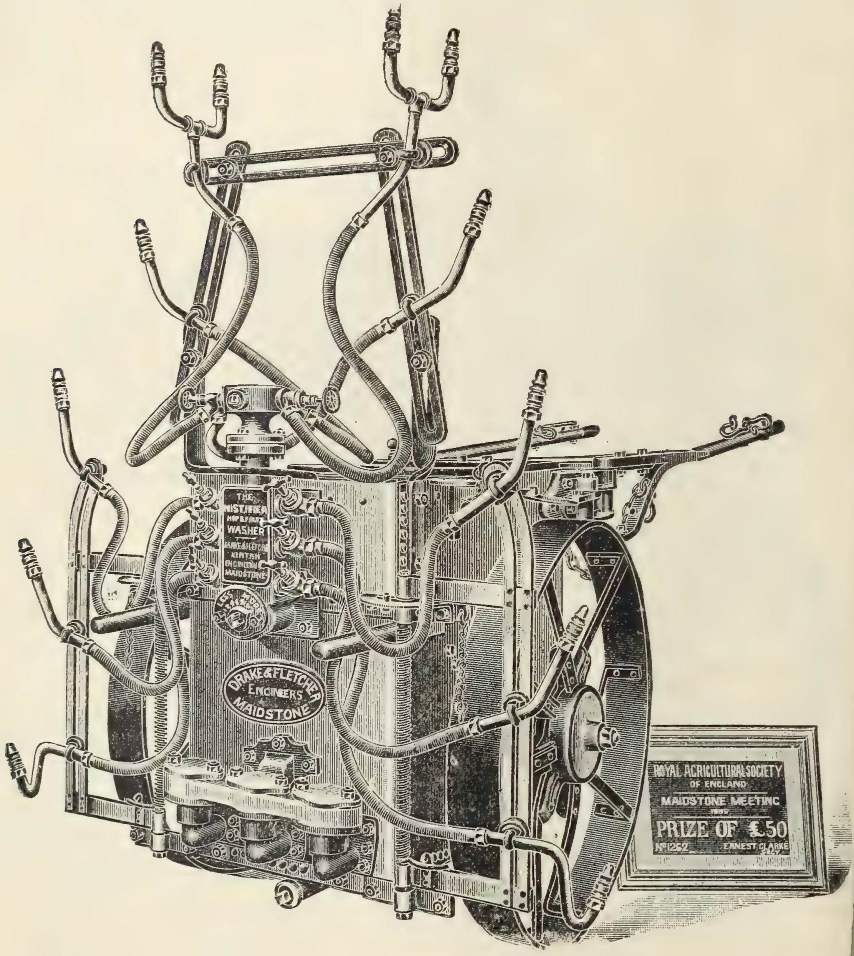

FIG. 2.—HORSE-POWER HOP SPRAYING MACHINE.

wheels, those having only two wheels being fitted with feet, as rests, behind. They are moved by means of handles, in wheelbarrow fashion, with or without help by a man or a horse pulling from the front. The smaller machines are worked by two men to spray and a lad to pump and wheel. The two pieces of delivery hose may be of any desired length. When the ground

is soft, rough, or hilly, the wheeling of even a 30-gallon machine is very hard work, and the lad needs the help of one of the men for every shift of position. There is a drawhook in front, to which a rope, billet, or whippletree can be fastened, and shafts are attached to any machine when desired. A horse is needed for the larger machines. They are made only 22 inches wide, outside the wheels, for work in the narrow spaces between rows of bushes.

Other manufacturers make hand-power machines similar in appearance, and the differences that exist are mainly in pumps and spraying nozzles, upon which efficiency is largely dependent. A hand-sprayer of the garden engine type is also made by Messrs. Henry S. Tett & Company, of Faversham. Fig. 1 is an

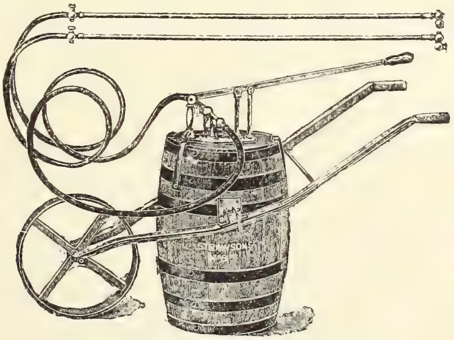

FIG. 3.—SMALL BARREL PUMP.

illustration of the hand-power type of spraying machine. Those of comparatively small size, which can be wheeled with the help of a man pulling in front, are most suitable for plantations of trees and bushes in which the growth has left very little space between the rows, as a horse, with a swinging whippletree, is likely occasionally to damage the trees and bushes, especially in turning in and out at the ends of the rows. Indeed, where there is room for a horse, there is room for one of the horse-power machines, illustrated in Fig. 2, which spray as they travel along, and have no hose to be dragged in and out among the trees and bushes.

Messrs. Strawson have brought out this season a handy and inexpensive sprayer in the form of a barrel containing the pump suspended vertically to the frame of a kind of sack-barrow, with only one wheel. The pump is a brass one of considerable power, with brass valves. All internal parts are readily accessible, and

as nearly incorrodible as any fittings can be. The barrel contains an agitator, and there is a strainer to keep any matter out of the pump that might clog the nozzles. There are two spraying tubes and lengths of rubber hose. The smallest machine contains 10 gallons, larger sizes being made.

As the labour of wheeling even small machines by hand in hilly fields is considerable, especially when the land is soft

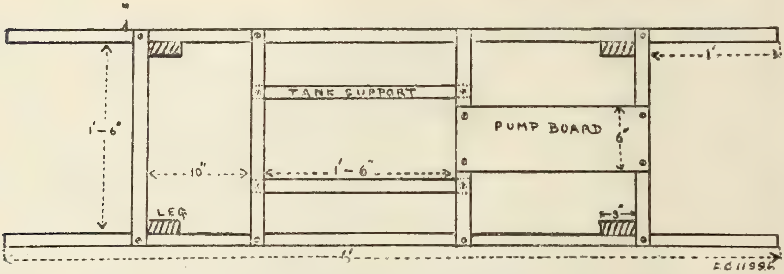

FIG. 4.—PLAN OF BARROW.

from rain or loose after recent forking, the present writer had a cistern and pump fixed on what is known as a nurseryman's hand-barrow, to be carried by two men, or a man and a lad, the one who works the pump and one of the spraying men, when shifting the position of the machine. The construction of the hand-barrow can be seen from the illustrations, Fig. 4–8.*

The pump is a Strawson's No. 3 brass pump, and the reservoir is a 20-gallon galvanised cistern measuring 1 ft. 6 in. every way. It is important to order the cistern without the usual strengthening rim round the top, as a wooden rim, 1½ in. thick and 2 in. deep, instead has to be made, fitted closely, and firmly screwed to the top sides of the cisterns, all cracks which would allow the spray solution to splash out being caulked with yarn and white or red lead. The agitator shown in Fig. 6 is next made and fitted. It should clear the bottom of the tank by about 1 in. Oak is the best wood to use for the framework. The vanes can be made of any thin wood; a piece of fretwood will do excellently. A row of screw-eyes is put in along the top bar of the frame. An iron rod is run right through the tank, about an inch out of the centre, and about half-way down the wooden rim, passing

* Figs. 4–8 are reproduced by permission of the Proprietors of the *Profitable Farm and Garden.*

through the row of screw-eyes on its way. This bar should be secured by a head on one side of the tank and a split pin or nut on the other, so that it can be easily withdrawn if it is necessary to remove the agitator for cleaning.

The 1-in. rubber suction tube shown in Fig. 5 is carried to a strainer (Fig. 8) consisting of a $1\frac{1}{2}$-in. gas barrel flange, a nipple, plug, and reducing T $1\frac{1}{2}$ in. to $\frac{3}{4}$ in. To obtain a larger straining area than the size of the suction tube, a wooden washer is placed between the bottom of the cistern and the flange. A strainer of fine brass wire gauze is placed next to the cistern, and the

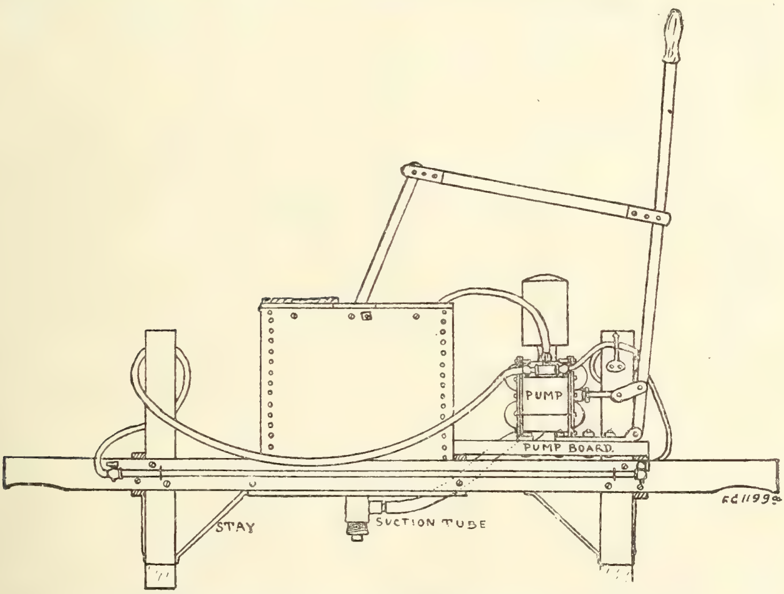

FIG. 5.—THE SPRAYING OUTFIT COMPLETE. (A section.)

whole apparatus is bolted together, the suction tube being attached to a piece of $\frac{3}{4}$-in gas barrel screwed into the T. The plug is fitted to the T for flushing purposes. The pump is bolted into its position, and the pump handle connected to the handle of the agitator (see Fig. 5) by a connecting rod, made as in Fig. 7. The position of this rod must be found by experiment. It is made 2 ft. long from hole to hole. It should first be fixed to the pump handle, and then a gimlet passed through the hole in the other end into the agitator handle, until on the full stroke of the pump being made the agitator will travel backwards and forwards in the tank without touching the

sides. When this position is found the agitator handle is sawn off, and the end shaped as in Fig. 6, and the connecting rod joined up to it by a bolt running right through, as at the pump handle end. In the machine represented by Fig. 5 the connections are made at 1 ft. 2 in. up the agitator handle, and 1 ft. 8 in. up the pump handle, the connecting rod being 2 ft. long. The pump is coupled to the suction strainer by a piece of india-rubber tube. The pump should be fitted with three delivery taps. Two of these are for the spraying tubes, and one has a short piece of tube taken from it into the top of the tank. This is used when starting to spray with Bordeaux mixture or any like solution, which will settle on standing. The other two taps are closed and this

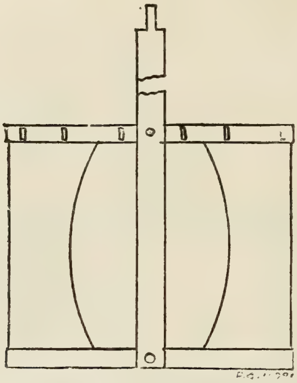

FIG. 6.—AGITATOR FOR CISTERN

one is opened, and a few strokes of the pump are given, until the fluid is thoroughly mixed. After this the agitator will prevent all settlement, and the third tap is shut off. The spraying tubes and nozzles should be bought with the pump. The metal part consists of a brass tube 4 ft. long, fitted with a tap at one end and a spraying nozzle at the other; and the rubber tube should be of any length convenient for the number of rows of trees proposed to be sprayed at one journey across the field. The tubes must be firmly fixed to the taps, or the pressure will drive them off.

Shoulder-straps are used when the machine has to be carried full for any considerable distance, but are not needed for the short shifts when spraying is going on. The machine costs little to make, and it is easier to carry it than to wheel a

machine even of its small dimensions. The man or lad who pumps and one of the spraying men shift it in the field. The chief objection to it, as to any sprayer that has to be moved by hand, is that one of the spraying men has to lay down his tube and hose to move it.

One great objection to all machines used with long pieces of hose, to spray three or more rows of trees and bushes on either side, is that of having to lift the hose over the bushes. Unless great care is exercised, branches of bushes or trees get caught and broken. The only way of avoiding this difficulty, where there is no space for a horse-power machine, would be by using

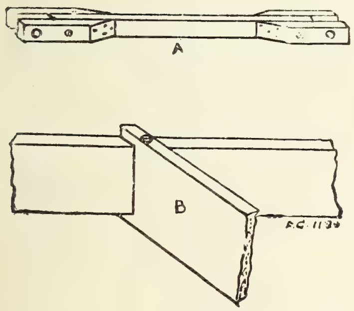

FIG. 7.—A, CONNECTING ROD; B, JOINT IN FRAMEWORK OF BARROW.

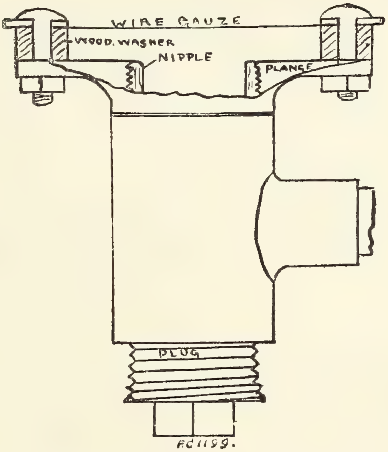

FIG. 8.—SECTION OF SUCTION STRAINER.

a narrow machine propelled and worked as it travels by an oil motor, and no such machine has yet been made. Two half rows would then be done at a time, and no hose would be required.

An adaptation of the hand-power system of spraying has been brought out by Messrs. Weeks & Son, by means of which the pumping engine and the liquid supply can be kept outside the plantation or on one of the headlands. The machine holds 100 gallons, and is worked by two lads by means of two cranks, one on each side. A hose main 500 ft. or 600 ft. long is attached to a reel, which is rolled by the spraying men. From each side of it there is a delivery hose with two nozzles, so that four men can spray. When the reel has to be shifted, the hose is deposited on the ground. The apparatus is said to be adapted

for the thickest plantation, and a large area can be sprayed without moving the pumping engine.

The horse-power hop-spraying machine, of which an illustration has been given (Fig. 2), is used also as a fruit sprayer. The nozzles can be set in any direction, some being directed low enough for bushes and the lower portions of the trunks of trees, and others towards the higher portions of trees. This type of

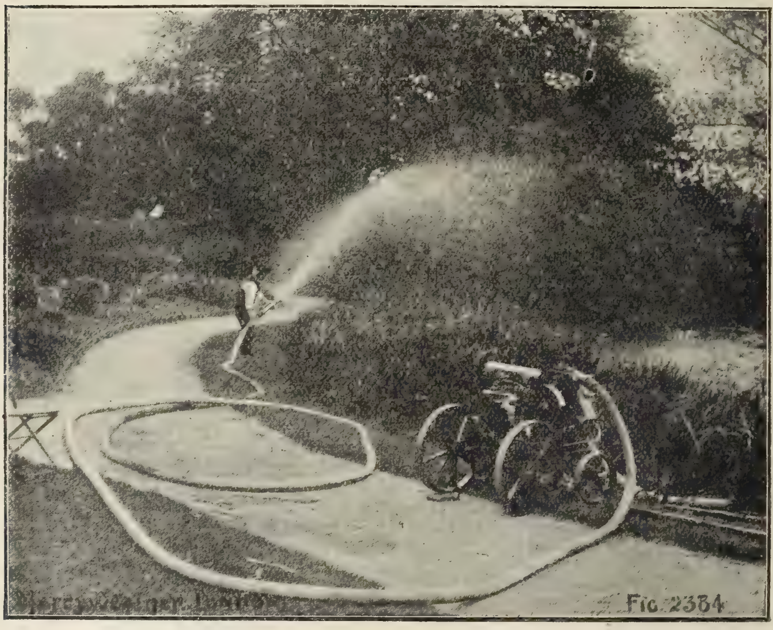

FIG. 9.*—PETROL MOTOR PUMP.

machine, where there is room for it between the rows of trees, possesses the great advantages of superseding the use of hose and of getting quickly over the ground.

For spraying lofty and widely spreading trees there is no doubt that the force supplied only by steam or oil engines is desirable. It cannot be imagined that horse-power machines can effectually spray such trees as they travel along, and it is doubtful whether even steam or oil motors, unless worked by means of hose while stationary for the time being, would spray trees of such size all over. The spraying operators must have time to change their positions, working all round large trees in order to cover every

* Figs. 9 and 10 are reproduced by permission of Messrs. Merryweather & Sons.

part with spray, unless they are mounted on a vehicle and use very long spraying tubes. In the United States and Canada,

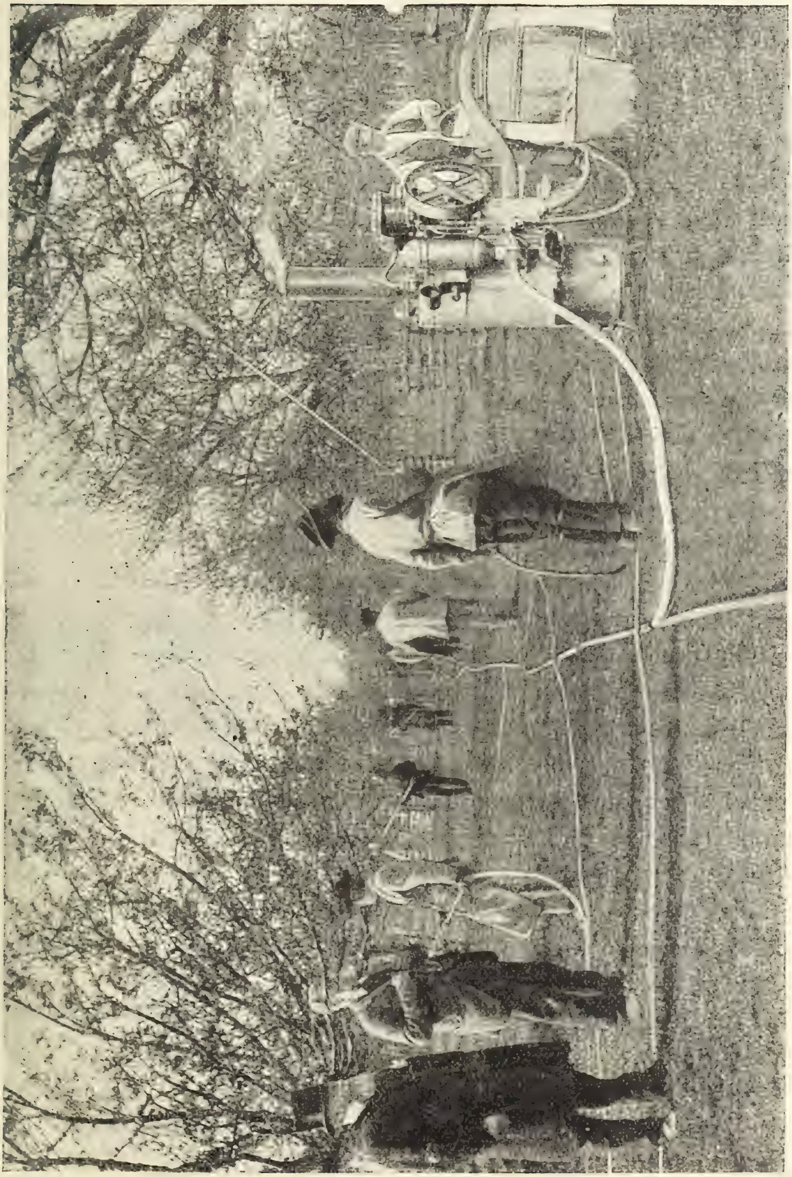

FIG. 10.—STEAM PUMPING ENGINE AT WORK.

where apple trees grow to a great size, the rows are so far apart that there is plenty of room to draw a waggon between them, and this plan is adopted for spraying large trees, the pumping

engines and spraying men being in the waggons, the men using very long tubes, which they work among the branches when necessary. In this country trees are much more thickly planted, and such a plan of operating, except possibly in cherry orchards, would not be feasible.

The steam-spraying system introduced by Messrs. Merryweather & Sons, of Long Acre, London, is adapted to the spraying of lofty trees, as well as trees and bushes of ordinary size. Their "Valiant" steam pumping engine, well known as a fire-engine, with a main pipe and branches of rubber hose, is in use in some of the large fruit plantations. It is a portable engine, and is made in three sizes, with pumping capacities of 840, 1,200, and 1,700 gallons per hour respectively. By the engine of the second size 600 gallons per hour can be pumped through two miles of $1\frac{1}{2}$-in. pipe on the level or through half a mile of such pipe to the height of 150 ft. above the pump level. This gives some idea of the force that can be utilised. Or, to be more specific, the steam pump will propel a liquid from a $\frac{3}{4}$-in. nozzle to the height of 90 ft. By means of the main and branch pipes an area of 240 ft. by 120 ft. can be sprayed without shifting the main. From six to fifteen sprayers can be kept at work at one time, according to the size of engine used. It is hardly necessary to state that the engine can also be used for various farm purposes. The same manufacturers supply a spraying machine of the capacity of 40 gallons wheeled by hand, but worked by a petrol motor; also a more powerful petrol motor pump, the "Hatfield."

Messrs. Drake & Fletcher also make spraying portable or fixed oil engines, combined with vertical ram pumps driven by gearing or belt, for pumping spray-liquor to fruit or hop plantations to fill spraying machines, or to use for spraying direct from the piping.

From the preceding descriptions it will be seen that much enterprise has been directed to spraying machinery in recent years.

WILLIAM E. BEAR.

THE CUCUMBER LEAF BLOTCH OR "SPOT" DISEASE.

The Cucumber Leaf "Spot" disease (*Cercospora melonis*), of which an account is given in the Board of Agriculture leaflet No. 76, continues to work great havoc among the market growers of cucumbers in the Lea Valley. Various methods of meeting the attack have been tried, but so far without any effect. In one range of houses near Harpenden, spraying with Bordeaux mixture and with a solution of liver of sulphur failed to check the disease, so that last winter a very thorough campaign was entered on to get rid of it. First of all, the empty houses were washed down with a 5 per cent. solution of copper sulphate; everything was well wetted with this, and the surface soil saturated so as to get rid as far as possible of spores within the house. Fresh soil was introduced for the new crop, and the young plants were raised in a house that had been free from disease. To give the plants every chance, a good dressing of potassium sulphate was incorporated with the new soil. On March 25th the treatment recommended by Mr. G. Massee (*Jour.* Roy. Hort. Soc., Vol. XXVIII., 1903, p. 142) was begun, and the soil was watered every fourth day with a solution of copper sulphate containing 1 oz. copper sulphate in 36 gallons of water. This treatment seemed at first successful, and one cutting of cucumbers was obtained; but just as the plants should have been in their most vigorous bearing, they collapsed as badly as ever with the "spot" disease, and had to be cleared out. The spots had never been absent during the copper treatment, but at first they did not appear to run so readily as they had done in former years, until, with some change in the weather or other unknown cause the attack became as virulent as ever. It was also noticed that the treatment seemed to render the plants more susceptible than usual to red spider, which was rampant at the time the plants collapsed.

On the whole, it appeared as though the copper treatment deferred the attack somewhat; but as soon as the strain of bearing fell upon the plant it had not vigour to maintain itself against the joint attack of the fungus and the red spider.

Leaves and stems of the treated plant showed no copper on examination in the laboratory.

The second crop was watered with copper sulphate solution as before, and early in September, when the growth was about five feet high, the leaves on half the plants in each house were also sprayed with cupram (see *Journal of the Board of Agriculture*, Vol. XI., 1904, p. 287), 1 oz. of copper carbonate dissolved in ammonia and diluted to 10 gallons of water.

The leaves showed in a few days some signs of injury, and were more attacked by *Cercospora* than the unsprayed leaves, so that the other plants in each house were treated with the same mixture at half the strength, a few plants in each case being left as checks. Although the treatment was renewed twice a week until the fruit began to form, and although the copper sulphate solution was being applied to the root at the same time, there was little gain from the treatment; as before, one cutting of cucumbers was marketed and then the whole plant collapsed.

There seems but little hope from copper treatment in any form; in this case it had a very careful and thorough trial upon a large scale, yet the disease ran its usual course. The houses under experiment are six in number, of the ordinary type, about 180 ft. long, lying side by side on a gentle slope in the Lea Valley. As usual, the spots were first seen on the foliage near the ventilators; they were always more numerous on the sunny side of the houses; and the disease was at its worst in the upper houses, which are also the warmest, since they are all connected under the gutters.

The eradication of this disease offers an exceedingly difficult problem; the cucumbers are grown in a very forcing soil, consisting of nearly half farmyard manure; the temperature is high and the humidity great. In consequence, the leaves are soft in the extreme and nearly always have the damp surface which affords an excellent germinating ground for fungus spores. There seems little doubt but that the spores blow in from outside, arising from the *débris* of previous crops and material returned from market, &c. Some places are still free from disease, but it also occurs in ranges of glass houses that are isolated and not within two or three miles of any other cucumber grower; in

such cases the spores have doubtless come in boxes, &c., returned from market. The most hopeful line of attack is probably to find a disease-proof variety; the variety that is at present commonly grown has been going for many years, and is generally propagated year after year from his own stock by the grower, who rarely tries a change of seed. Something might be done by giving the establishment a year's rest from cucumber growing, so as to get rid of the disease spores; for the very general idea amongst market gardeners that the disease has now spread to other plants out of doors is a mistaken one, the many kinds of leaf blotch which were so common out of doors in 1904 being caused by quite different fungi.

A. D. HALL.

MILK TESTING AND CONTROL IN DENMARK.

In connection with the arrangements referred to in the preceding number of this *Journal* (Vol. XI., p. 743) as to the testing of milk for farmers by the Agricultural Colleges of this country, it may be of interest to describe the milk testing or control societies which exist in Denmark and in several other Continental countries for the purpose of enabling farmers to ascertain the productive capability of their cows, and thus to control the constitution of their herds and the average production of milk and butter. It is recognised that the profit from a cow depends on three factors—(1) the milk yield, (2) the percentage of butter-fat in the milk, and (3) the fodder consumed. Thus, to take an example from a report of one of these societies, two cows gave respectively in 1900 (A) 10,267 lb. of milk and (B) 10,653 lb.; the difference in quantity was not great, and both cows might have been regarded as fairly equal. The tests showed however,that the average fat content in the case of (A) was 2·75 per cent. and in the case of (B) 3·56 per cent., giving a difference in the butter produced in the course of the year of 112 lb., while in addition the cow (A) had consumed considerably more fodder than the other. It was to reveal such cases as this and to enable the Danish farmer effectively to control the milk production of his cows that the first of these societies was started in 1895 at

Vejen. Briefly, the method adopted was to employ a young man possessing the necessary experience in milk testing to visit each of the dairies belonging to the society once in fourteen days to test, by means of the Gerber apparatus, the milk of each cow, and to enter up in books kept for the purpose particulars as to the amount of fodder consumed, the milk produced, the fat and butter yield, and the changes in the live weight of each animal.

The success which attended the establishment of the first society at Vejen soon led to a great extension of the system in Denmark, and in 1902 there were 308 societies with 3,780 members possessing 136,800 cows. In 1904 the number of societies had increased to 340. The movement spread also to the neighbouring countries, and there were reported to be 204 societies in Sweden, 120 in Norway, 40 in Finland, and 50 in Germany. In Denmark the societies receive a State grant amounting in 1902–3 to £2,900, of which one society received £27, five societies £18 each, and 302 societies £9 each.

These control societies were described by Dr. Buer* as small co-operative bodies in which the farmers in a limited area, such as a parish, have combined in order to share the expense of testing their cows, the object, as stated in the rules, being to form a race of cows giving the highest possible production of butter. The number of members is usually limited to twelve or thirteen, having altogether 300 to 400 cows, and no member can withdraw in less than five years, except in consequence of removal. Three of the members form a committee, one of whom acts as treasurer. An assistant is engaged, who visits the members at regular intervals (usually once a fortnight), and remains on the farm for a day. His duties are to superintend the milking and give any necessary instructions to the milkers, to weigh the milk of each cow, to take and test an average sample, to prescribe a proper system of feeding, and to enter up in the books the results of the control.

To carry out these duties it is necessary that the assistant should have received a sound practical and theoretical education. The most suitable persons are usually farmers' sons who have had practical experience on their fathers' farms, and afterwards,

* Die dänischen Kontrollvereine, Berlin, 1902.

by attending an agricultural school, acquired the elements of agricultural science. Special courses are held for persons intending to take up the position of control-assistants, in which instruction is given in the special knowledge required, *i.e.*, systems of feeding, milk sampling and testing, book-keeping, &c. It is obviously important that the assistants should be capable and trustworthy men; but as the position is regarded as an excellent training ground for young men intending to become agricultural officials, inspectors, &c., or farmers on their own account, the salary is usually small—about £23, with board and lodging. The outfit required for the work consists of Gerber's milk-testing apparatus, the size ordinarily used being for twenty-four tests, with the necessary test tubes, sample bottles, &c., and a steelyard for weighing milk, the whole being packed in a box for transport. The cost is about £12, and this, together with all books required, is supplied by the society.

With regard to the consumption of fodder, it was necessary to arrive at some unit by which the relative value of the various feeding-stuffs could be expressed. For this purpose numerous experiments were conducted in Denmark, at first with pigs and afterwards with cows. In these experiments, which were conducted on a number of farms, the object throughout was to compare one feeding-stuff with another. Thus in the earlier tests with swine in 1885 and 1886, skim-milk and whey were compared, and it was concluded that 1 lb. of skim-milk produced the same result as 2 lb. of whey; similarly, a comparison of grain and skim-milk showed that 1 lb. of grain had the same effect as 6 lb. of skim-milk. Tests of a similar character were begun with cows in 1887, and were continued until 1895. At the end of the experiments, the conclusion arrived at was that the quantities of feeding-stuffs mentioned below might be treated as equal to one another and calculated as one "feeding-unit."

1 lb. mixed corn.
1 lb. wheat.
1 lb. bran.
1 lb. oilcake and other concentrated foods.
2 lb. clover hay.
2½ lb. meadow hay.
10 lb. mangolds.
12 lb. turnips.
4 lb. straw.
10 lb. green fodder.
4 lb. potatoes.
2 lb. whole milk.
6 lb. skim-milk.
12 lb. whey.

This is considered to be sufficiently exact for practical purposes and for the purposes of the control.

One day's grazing is, according to the quality of the herbage and the weight of the animals, taken as equivalent to from eight to fourteen feeding-units. By the use of this scale it is possible to express the total food given to cows as so many feeding-units, and by this means to compare the results obtained under different methods of feeding.

In a report which has recently been published by the German Agricultural Society,* Dr. Emil Pott devotes some attention to the means by which the food consumption of the animals is reckoned, and points out that the Danish system of calculation by feeding-units is open to the objection that the equivalent values attaching to the different feeding-stuffs are at the best only approximate, since even if food values could be scientifically calculated the quality of the materials varies in different cases, while the nutritive effect of the same fodder may vary according to the food with which it is combined. He recommends in preference the use of the average market price in the case of purchased feeding-stuffs and the average cost of production in the case of home-grown fodder. This has been adopted by many of the German Societies, and the statement of how much it costs to produce so many pounds of milk containing a certain percentage of fat is found to be better understood than the similar calculation in feeding-units. In order to enable comparison to be made, it is necessary for all the societies in a district to agree on a scale of values by which all the members calculate the cost of feeding. For instance, in eight societies in the Rhine Province the following scale has been adopted per cwt. :—Meadow hay, 2s. ; clover hay, 2s. 6d. ; mangolds, 6d. ; sugar-beet, 9½d. ; linseed meal and cake, 7s. 6d. ; cottonseed meal, 6s. 9d. ; rape cake, 4s. 6d. ; bran, 4s. 9½d. ; rice meal, 5s. 1d. ; peas and beans, 8s. 2d. ; oats and rye, 7s. ; barley, 6s. 2½d. ; maize, 6s. 6d. As one object of the control is economy in feeding, that result is probably more likely to be attained by keeping before the farmer's eyes the money cost of each cow rather than the cost in feeding-units.

* Kontrollvereine für Milchleistungen, Berlin, 1904. *See also* Der Wettbewerb der dänischen und der schwedischen Landwirte mit Deutschland, Stuttgart, 1904.

In order to arrive accurately at the cost of production it is necessary that the cows, instead of being all fed alike, as was the case before the introduction of the control system, should have their food carefully measured out to them, and a scheme of feeding adopted suitable to the requirements of each cow. In some instances, however, it is considered sufficient to divide the animals into three classes, viz., I., heavy milkers; II., medium milkers; and III., small milkers and dry cows. For example, in the Rhine Province of Germany the following method was practised:—

	Class I.	Class II.	Class III.
	lb.	lb.	lb.
Concentrated feeding-stuffs	11	$6\frac{3}{5}$	$2\frac{1}{5}$
Roots	66	66	44
Hay	11	11	$16\frac{1}{2}$
Straw	As much as they will eat.		

and on another farm

	lb.	lb.	lb.
Concentrated feeding-stuffs	$13\frac{1}{5}$	11	$6\frac{3}{5}$
Roots	55	$38\frac{1}{2}$	22
Straw	As much as they will eat.		

In Schleswig-Holstein the best cows are stated to receive $6\frac{1}{2}$ to $8\frac{3}{4}$ lb. of concentrated food, 77–100 lb. of roots, only a little hay ($3\frac{1}{4}$–$5\frac{1}{2}$ lb.), with straw. The second group got $4\frac{1}{2}$ to $6\frac{1}{2}$ lb. concentrated food, 55 to 75 lb. roots; and the dry cows at the most a little over 2 lb. of oilcake, &c., with about 28 lb. of roots, and straw at will.

The value of the control system may be said to depend entirely on the keeping of accurate records of the tests and of the food consumed in such a form as to enable the farmer to see exactly the relative capabilities and cost of each individual cow and of the herd as a whole, and also to compare in the annual or half-yearly reports the results obtained by other members of the Club. With this view a scheme of book-keeping was drawn up in 1899 by a committee of the Jutland Agricultural Society and of representatives of the Control Societies. In the first place, the farmer is required to keep a diary, in which the rations fed to each cow are entered. When the assistant visits the farm the results of his tests, &c., are put down on a "record" drawn up in the following form:—

Name of Owner..

Date of control .... Date of previous control ....

Name of cow.	No.	Milk (in pounds.) Afternoon.	Morning.	Evening.	Total.	Per cent. of fat.	Pounds of milk containing 1 per cent. of fat.	Pounds of milk in 14 days.	Butter (in 14 days.) lb.	cwt	Feeding-units in 14 days. Oilcake.	Grain and Bran.	Grazing.	Green fodder.	Roots.	Hay.	Straw.	Total feeding-units.	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Tl.																			

The quantity of milk in 14 days (Col. 9) is estimated by multiplying the ascertained yield on the control-day by 14. The quantity of butter (Cols. 10 and 11) is arrived at by estimating that butter contains 86 per cent. of pure butter-fat, and that ·15 per cent. of the fat remains in the skim milk and butter-milk: [Lb. of milk containing 1 per cent. of fat — (lb. of milk × ·15)] ÷ 86, or, more simply: Lb. of milk (Col. 9) × (per cent. of fat (Col. 7) — ·15) ÷ 86. Tables are published in which this calculation is worked out. The feeding-units in Cols. 12–19 are calculated from the record of food used on the basis explained above.

From this "record" the "control register" is entered up. There are in all seven tables, the first of which, shown on the next page, gives particulars fortnightly for each cow for a year.

This table enables the productivity of each cow to be seen at intervals of a fortnight. A summary is made up half-yearly which, besides giving the total figures, also shows the average milk yield per day, the feeding-units consumed daily, and the quantity of milk and butter produced per 100 feeding-units consumed.

TABLE I.

Year.................. No. of Cow.................. Name.....................
Herd-book No.......... Breed.....................
Date of birth............ Live weight in lb. on ....
Dam... .... Calved on.................. Particulars as to calf
Sire .... Name of bull ....

Control.				No. of days.	Milk and butter production in the control period.				Feeding-units consumed in the control period.								Remarks.
Date.	For the period from ....to........	Milk. lb.	Fat per cent.		Milk. lb.	Butter. lb.	Butter. cwt	Pounds milk with 1% fat.	Oilcake.	Other concentrated foods.	Roots.	Grazing.	Green fodder.	Hay.	Straw.	Total.	

The next table (Table II.) brings together the records of all the cows on the farm so as to show the food consumed and

TABLE II.

Control.			No. of feeding-days.	Concentrated food consumed.			Feeding units of other foods Cols. 15-19.	Total feeding-units.	No. of days grazing.	Lb. of milk on control-day.	Milk in whole period.		Average % fat.	Total lb. butter.	Milk to 1 lb. butter.	Total milk 1 % fat.	Per cow per day.		100 feeding-units produced.	
Date.	Interval from ....to...........	No. of days.		Oilcake.	Other kinds Cols. 6-14.						By milking tests.	By weighing.					Milk.	Feeding-units.	Milk.	Butter.
1	2	3	4	5				20	21	22	23	24	25	26	27	28	29	30	31	32

the production. This is of the greatest importance, as while Table I. gives particulars of individual cows, Table II. enables the farmer to see the general results of his operations at regular intervals.

Columns are also provided to show the number of cows on the farm on control-day, according to age, additions to stock, &c. The number of feeding-days (Col. 4) is arrived at by multiplying the period (Col. 3) by the number of cows kept, allowing for changes in the interval.

The production of milk in the whole period (Col. 23) is ascertained by multiplying Col. 3 (number of days) by Col. 22 (yield of milk on control-day), while Col. 24, which is the production of milk so far as is known, taking into account the milk used in the dairy, the house, and for calves, forms a check on this figure.

These tables are summarised in several annual tables for purposes of comparison. Thus, Table III. is a statement of the milk and butter yield of each cow, with the food consumed. Tables IV. and V. give the annual average yield and consumption per cow on each farm in the society, and Table VI. combines the averages of each society by districts.

The control system thus provides a systematic view of the productive capabilities of each cow, the value of which can hardly be over-estimated. From it the farmer learns to know his cows, both from the point of view of yield and consumption. Not infrequently cows are found on the same system of feeding to produce little more than half as much as others, or to give a good yield of milk with a low percentage of fat. These unprofitable cows can be weeded out and their places filled by more productive animals. On very many farms, after four or five years' control, the average production per cow has been raised by this means by 30 to 50 lb. of butter annually. This has in most cases been accompanied by a more economical consumption of food. Still greater importance is perhaps to be attached to the fact that the control system provides a safe basis on which an improved breed of cows can be built up and the productive capabilities of the herds raised.

Green Manuring.

The value of green manuring as a means of improving the soil has been recognised from early times, but it is only in recent years that scientific investigations have been made into the conditions connected with it. Experiments conducted by M. Schultz, at Lupitz, in Saxony, over a period of forty years, showed conclusively the value of the method for the improvement of light, sandy soil. The basis of this system was the (1) cultivation of leguminous plants, notably lupins, in alternation with cereals, potatoes, and other crops; and (2) the use of lime, potash, and phosphoric acid, without any nitrogenous manures. The method was followed on the whole of the Lupitz estate of 600 acres, and in 1891 the result of the experiment was described by M. Schultz in the following words:—"With a limited stock of fatting cattle, without buying any nitrogenous manures, by adding potash, phosphoric acid, and lime, I have succeeded in fixing, at the expense of the atmosphere, a considerable quantity of nitrogen, by which I have been enabled to diminish by 50 per cent. the expense of the production of cereals grown at Lupitz; or, which comes to the same thing, to raise the average profit to 30s. per acre, notwithstanding the unfavourable state of the markets."

The advantages of green manuring, so strikingly illustrated by the success of the Lupitz method, are due to the fact that the leguminous plants used for green manuring supply the soil with nitrogen in an easily available form for the use of the following crop. Like the straw in farmyard manure, they enrich the soil in humus, and on porous soils and in dry weather this decaying humus is valuable as a means of retaining moisture. The deep-rooted plants which are frequently employed draw up a supply of mineral food from the subsoil, and thus enrich the surface soil, while they help to open up the subsoil for the succeeding crop. The essential factor of the Lupitz system is the substitution of leguminous plants, possessing the power of gathering nitrogen from the air, for farmyard manure The plants to be selected for green manuring should, therefore, be leguminous, *i.e.*, peas, beans, vetches, lupins, serradella, clovers, &c., if it is intended to employ green manuring as a cheap substitute for farmyard manure. Non-leguminous

plants, such as rape, mustard, hemp, &c., are not now recommended.

Other plant food—*i.e.*, potash, phosphates, and lime—must be present in sufficient quantities in the soil to produce luxuriant growth. If amply manured with kainit and basic slag, and also with lime if necessary, the absence of nitrogenous manures causes leguminous plants to become "nitrogen-hungry" and to take up the free nitrogen of the air in the largest possible quantities. But it is not only the nitrogen obtained from the air which makes this method of manuring a cheap one; it has the further advantage that it is produced where it is to be employed, thus saving the labour of carting, especially where fields are far from the manure heap. It is also valuable where manure is scarce.

The question of green manuring has recently attracted a good deal of attention in Germany, and a summary of the points which have been discussed has been contributed by Dr. Schnider to the *Praktische Blätter für Pflanzenbau* (1904, Parts 2–7). Dr. Schnider mentions that on light land in Germany, lupins, the vetch, pea, and serradella are most commonly employed, peas and vetches also on medium or heavy land, as well as yellow and alsike clovers and horse beans. These may be sown on stubble as an intermediate crop, or with corn, or on land which would otherwise be left fallow. In the first case when wheat, for example, is followed by barley or turnips, the wheat stubble may be sown with some quick-growing leguminous crop, which may be ploughed in during the late autumn. In the same way, where from any cause it is found necessary to allow the land to remain fallow, green manuring may be adopted. It may also be used as a means of improving very poor land. Dr. Schnider states that this method of fertilising is probably most advantageous to hoed crops, particularly roots, and also for oats. It is perhaps less suitable for wheat and barley. According to experiments at Lauchstädt in 1903 and previous years, green manuring with peas, beans, and vetches after spring or winter barley gave good results with beets, but was less effective with potatoes.

Among the questions which have been investigated in recent years are the time and depth of ploughing; the effect of green

manuring on heavy land, and its employment for other crops, such as vegetables, fruit and forest trees, hops, and grass land; the value of serradella, &c.

Schultz took the view that the plants should be ploughed-in deeply enough to completely bury them, but Causemann and other practical agriculturists maintain that experience has shown shallow covering both of green and farmyard manure to be more satisfactory, and in this they have the support of Dr. Hiltner, of Munich. The explanation offered is that the more easily the oxygen of the air reaches the buried manure, the quicker and more completely does it become available as plant food. The bacteria which play such an important part in the process of nitrification require oxygen, so that a too deep burying or burying in wet, undrained land, or the formation of a surface crust, hinders the formation of nitrates, whilst the admission of air and the addition of lime to the soil promote it. By shallow ploughing, heavier crops have been obtained than those grown by Schultz on the same class of land. It is also considered that the work should take place late, rather than early, in the autumn, and that the sowing of winter grain should follow immediately after the breaking up of the field. Although, apparently practical experience in Germany is, on the whole, favourable to the view that the ploughing-in both of green crops and farmyard manure should be shallow rather than deep, the opposite view is not without its supporters, and the comparative merits of the two methods may be regarded as a subject for further experiment.

The advantages of green manuring as compared with bare fallow have also attracted attention. On this point Fruwirth made experiments at Hohenheim in 1901 and 1902. Two plots of similar size were selected, one being sown after corn harvest with beans, blue lupins, peas and vetches, while the other was ploughed at the same time. The green crop was buried about 9 in., and the other plot again ploughed. The subsequent crop (mangolds) on the former plot exceeded that on the latter by 2½ tons per acre, or a gain of 26s. per acre; deducting the cost of green manuring (20s.) there was a net gain of 6s. per acre. More favourable results have been obtained in certain instances by bare fallow than by green manuring; and experiments are

now being carried out at Lauchstädt with a view of ascertaining whether the fallowing of the soil promotes the collection of nitrogen and the activity of the bacteria to a greater extent than green manuring or other method.

The employment of green manuring on medium and heavy soils has many opponents, but several German agriculturists appear to have practised it with remarkable success for many years. In one instance, on clay, the cost is said to be less than one-half that of farmyard manure, and the yield of sugar beet has been increased by 2¾ tons per acre. An experiment conducted on loam by Dr. Scheidewind showed also on the average of four years an increase of nearly 2½ tons of sugar beet. Manuring with nitrate gave on the four years rather more leaf-development, but no more roots or sugar, and the cost of the nitrate was greater.

Among the crops suitable for green manuring, Dr. Schnider draws especial attention to serradella, which is much grown on the sandy soils of Northern Germany. It is said to be also suitable for medium and even heavy soils, and it is claimed that by its use an equivalent amount of nitrogen can be introduced into the soil at very much less cost than by farmyard manure.

Green manuring has also been successfully employed in orchards and hop gardens. In New South Wales the practice of sowing tares and peas in the early autumn among the trees in the Government orchards and ploughing the crop in has been found to give satisfactory results. At one of these orchards the character of the soil, which was formerly very harsh and stubborn, has, it is stated, been improved almost beyond recognition; and at the Hawkesbury Agricultural College, where the soil was almost pure sand, excellent fruit crops have been obtained owing to the addition to the soil of humus obtained by green manuring.

Experiments with Potatoes.

Experiments with potatoes have been conducted during the past seven years by the University of Leeds in order to test the productiveness and quality of a number of the best known varieties on the market. Subsidiary experiments have also been undertaken to determine the influence upon the crop of

different methods of storing seed, the influence of change of "seed," and the value of cut tubers for seed purposes. A report on the experiments conducted in 1904 affords interesting information on some of these points, particularly with regard to the practice of sprouting seed potatoes in boxes and of liming them for the prevention of wet rot, subjects to which reference has previously been made in this *Journal.*

Varieties.—A number of varieties are found to answer admirably in a favourable season, but large crops, good quality, and disease-resisting powers are associated with comparatively few in an unfavourable season. It is the varieties upon which reliance can be placed in *all* seasons that are chiefly wanted.

In 1904 the following varieties were tested:—British Lion, British Queen, Challenge, Charles Fidler, Conquest, Empress Queen, Evergood, Northern Star, Royal Kidney, Up-to-Date, and Up-to-Date No. 2, all except Northern Star being planted at two centres, and the seed drawn from stock grown under the same conditions.

Although the order of merit, as regards yield, was not strictly the same at both centres, the same six varieties cropped best in both cases, viz., Evergood, Up-to-Date, Royal Kidney, Empress Queen, British Queen, and Up-to-Date No. 2, and the results emphasised the fact that success or failure in potato growing may be determined largely by the choice of variety. Although grown under uniform conditions, one variety has been found to yield several tons less per acre than another, and this notwithstanding the fact that the seed has been in first-class condition.

Cooking Quality of Potatoes.—The cooking or table quality of the potatoes is as much affected by soil, season, and manurial conditions as their capacity for cropping, and too much reliance, therefore, should not be placed on single tests. Tests were carried out in 1903 and 1904, which enable the potatoes to be compared as regards quality as well as regards production and disease-resisting powers. The results are shown in the table on p. 34.

British Queen, Charles Fidler, and Up-to-Date maintain, it will be seen, their reputation for cooking quality. Three of the new varieties, Northern Star, Sir John Llewellyn, and Discovery, have likewise taken high positions. These three are of particu-

larly fine flavour, but lack somewhat in colour. Evergood cooked badly. This variety frequently shows, when cut, dark discoloration of the "flesh" which does not disappear with boiling. From the experience of some farmers in Yorkshire it would seem that Evergood is specially adapted for a heavier class of soil than the medium loam on which these were grown, and that when grown under these conditions the cooking quality is satisfactory.

Variety of Potato.	Colour. Maximum Marks 15.	Flavour. Maximum Marks 20.	Flouriness. Maximum Marks 15.	Total Marks, 1904. Maximum 50.	Total Marks, 1903. Maximum 50.
British Queen ...	14	18	15	47	44
Northern Star ...	12	20	14	46	—
Charles Fidler ...	15	15	15	45	48
Sir John Llewellyn ...	13	18	14	45	—
Discovery	12	19	13	44	—
Empress Queen ...	13	17	14	44	41
Up-to-Date	13	17	14	44	44
Up-to-Date No. 2 ...	13	17	14	44	44
Conquest	13	17	13	43	42
King Edward VII. ...	14	15	14	43	—
Royal Kidney ...	13	15	12	40	35
British Lion	15	12	12	39	43
Challenge	13	12	13	38	35
Goodfellow	13	13	12	38	—
Evergood	11	13	11	35	37

When the figures relating to quality are considered in conjunction with cropping and disease-resisting powers, the varieties range themselves in the following order of merit :—Up-to-Date, British Queen, Royal Kidney, Northern Star, Up-to-Date No. 2, Empress Queen, Evergood, Charles Fidler, Conquest, British Lion, Challenge. Evergood, one of the best disease-resisting potatoes, and a good cropper, suffers chiefly through its inferior cooking quality.

Preparation of Seed.—There are two methods of dealing with seed-potatoes—one, that of putting the seed-size tubers, when lifted, into shallow boxes,* and storing them in a well-lighted and well-ventilated shed until planting time—the other, that of straightway putting the seed into "pies" or "pits" in autumn, as is usually done, and leaving it there until about planting-time.

* An account of the method of sprouting seed potatoes recommended by the Irish Department of Agriculture was given in the *Journal*, Vol. XI., Feb. 1905, p. 673.

The first method specially commends itself to the grower of early potatoes who, in addition, may subject the tubers to a little artificial heat, but the difficulty of adopting it with second-early and late varieties is very great at a time when work presses. Were it possible to obtain equally good results by deferring the "boxing" till some time in winter or early spring when weather conditions permitted of the "pies" being opened and men could be spared for the work, then such a modification of the first method might be generally adopted by potato growers. Accordingly, three methods of dealing with seed potatoes were tested :—(1) Storing in boxes in autumn; (2) Storing in boxes during winter or early spring; and (3) "pieing" in autumn and planting direct from the "pies."

The comparative advantages of storing in boxes in winter or in early spring have been tested for several years. In 1902 and 1903 there was a slight advantage in favour of the spring-prepared seed, the conclusion being that quite as good crops may be looked for by giving the same attention to the preparation of the seed at either period of the year.

In order to get still further evidence on this question of seed-preparation, ten varieties were included in the test of 1904. Seed from the same stock as that put in boxes in autumn was "pied" in the usual way, transferred to boxes in spring as soon as the least signs of sprouting were noted, and exposed to light.

Of the ten varieties tested, nine showed a balance in favour of spring-preparation. The weight of evidence obtained in these experiments during the past three years certainly tends to show that quite as good crops can be obtained from spring as from autumn-prepared seed. This is regarded as satisfactory, for whereas it may be quite impracticable to "box" seed in the autumn, little difficulty should be experienced in getting it done at odd times in an average season during the winter or early spring. In spring, again, the risk of frost is not so great, and the question of accommodation is less serious.

Potatoes were also planted direct from the "pie" in 1903, and it was found that the crop obtained was two tons less than from the "boxed" seed. In 1904, therefore, a further test was made on this point with five varieties, when the following results were obtained :—

Variety.	Seed "boxed" in Autumn.			Seed "boxed" in Spring.			Seed planted direct from "Pie."			Advantage of Autumn-prepared Seed over Seed planted from "Pie."			Advantage of Spring-prepared Seed over Seed planted from "Pie."		
	Ton	cwt.	qr.	Ton	cwt.	qr.	Ton	cwt.	qr.	Ton	cwt.	qr.	Ton	cwt.	qr.
British Queen ...	12	16	2	13	7	1	12	0	0	0	16	2	1	7	1
Empress Queen	13	5	1	13	9	3	9	3	3	4	1	2	4	6	0
Evergood ...	14	10	2	14	15	3	13	2	2	1	8	0	1	13	1
Up-to-Date ...	14	8	3	13	7	2	13	1	1	1	7	2	0	6	1
Up-to-Date No. 2	12	8	1	12	16	2	12	2	2	0	5	3	0	14	0

Although the average advantage from five varieties in 1904 is somewhat less than that from the single variety (Up-to-Date) in 1903, it should be noted that the seed for the test in 1903 was taken from a "pie" containing several tons of potatoes, whereas the "pies" for the 1904 test were of necessity small, containing indeed only 500 tubers each. In these circumstances, heating or sweating could not take place to any great extent, and the cool condition of the "pies" discouraged sprouting. Moreover, the potatoes were planted some ten days earlier than in 1903, so that, all things considered, it was only to be expected that the difference would be less marked in 1904.

The balance of the evidence, therefore, seems to point to a distinct advantage from the preparing of seed. The results from Empress Queen may be looked upon as exceptional, but even if these be disregarded the advantage, on the average, from autumn- and spring-prepared seed over seed planted direct from the "pie" is still practically 20 cwt. per acre.

Another point which was investigated was the use of whole sets or cut sets for planting. When large potatoes were cut for seed, quite as good results were obtained from the cut sets as from seed-sized potatoes planted whole; when, however, tubers of only seed-size, or little more, were cut, the resulting crop was considerably less than from the cut sets. Cut sets should be planted as soon as possible after cutting, but if there is an interval between cutting and planting, dipping the newly-cut set into finely-powdered lime was found to be of distinct advantage.

Previous experiments have indicated that the same stock of seed should not be used on the same farm for more than three years, and preferably for only two. This was borne out in a

comparison made in 1904 with one variety, viz., Charles Fidler, in which case the crop from the third year's seed proved to be under 7 tons, whereas new seed of the same variety yielded 13¼ tons.

A suggestion is also made with regard to the improvement of existing varieties that have been in use for a number of years, and which are still of excellent merit. Selection of the most prolific plants is, it is pointed out, a branch of potato culture that has received comparatively little attention from the ordinary farmer, but this, carefully and systematically carried out with deserving varieties, would doubtless mean to them a new lease of life. In plant-breeding only the most productive plants are kept, the unproductive being ruthlessly discarded, and thus it is in great measure that new varieties are more prolific than older ones. In view of these facts there need be little doubt that the vigour of our older varieties may be increased, or at least maintained, by selection.

A New Disease in Potatoes.

Sphaerella tabifica,* a minute parasitic fungus, otherwise known as Beetroot and Mangold Rot, has recently been found attacking potatoes. This parasite has proved very destructive to sugar beet on the Continent, and equally so to mangolds in this country; swede turnips have suffered to a less extent. It has not previously been recorded as attacking potatoes.

The disease first appears on the leaves in the case of beet and turnips, and afterwards passes down to the root, and the same course appears to have been followed with the potatoes; as in the tubers which were forwarded to the Royal Botanic Gardens, Kew, for investigation, the earliest indication of disease was observed in the vascular ring of the tuber, at the point where it joined the stem, down which it passed. Land that has produced a diseased crop should not be used for growing potatoes, mangolds, or turnips for some years.

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* See *Journal*, Vol. XI., Nov. 1904, p. 488.

The most certain means of destroying the parasite present in the soil would be the application of gas-lime. This should be spread over the surface and allowed to remain for a month, after which it should be lightly mixed with the soil, but not buried deeply. Diseased potatoes should not be used for planting, and diseased portions that are cut off should not be thrown away, but should be burned, as the fungus reproduces itself very rapidly on such diseased scraps, and the spores are spread widely by wind, &c.

It is quite probable that the fungus can attack other root crops—carrots, parsnips, &c. Experiments on this point will be carried out at Kew.

Experiments in the Prevention of Turnip Fly.

At the request of the Board of Agriculture, Mr. R. B. Greig, of the Aberdeen and North of Scotland College of Agriculture, arranged during the past year to carry out experiments with a view of discovering a method of preventing the attack of the turnip fly.

In Aberdeenshire and the North of Scotland generally there was no attack of turnip fly in 1904, but as freedom from attack could not be anticipated, arrangements were made for the following trials of preventive methods:—(1) The seed was steeped in paraffin and dried before sowing; (2) the seed was steeped in turpentine and dried before sowing; (3) sand or sawdust damped with paraffin was strewn along the surface of the drills before the turnips were quite through the ground; and (4) the surface of the drill was sprayed with paraffin when the turnips were coming through the ground.

Returns were sent in from fifteen farms where these methods were tried. The "fly" did not appear, but some secondary results of the steeping are interesting.

In several cases steeping the seed in paraffin or turpentine produced an earlier and more vigorous growth, which lasted several weeks. One farmer, on whose turnips the steeping had a marked effect, though no "fly" appeared, stated that he weighed the turnips from the drills sown with seed steeped

in paraffin and in turpentine, and compared them with turnips from untreated seed, as follows:—

Paraffin ...	43 ft. 3 in.	of	27-in.	drill	gave	95 lb.	roots.
Turpentine	,,	,,	,,	,,	,,	97 lb.	,,
No treatment	,,	,,	,,	,,	,,	75 lb.	,,

The drills were side by side.

The question was raised as to the length of time turnip seed could be left in the paraffin or turpentine without injury to its vitality. To remove any doubts turnip seed was germinated that had been in paraffin or turpentine for varying periods. A few hours or a day made no difference; finally, after submerging the seed in both liquids for three weeks, no change could be found in the vitality or rapidity of germination as compared with unsteeped seed. On one farm, seed was steeped for periods varying from thirty minutes to three hours, and the longest period of steeping produced the earliest and most vigorous growth. Steeping in water for the same length of time did not produce the same effect.

On one or two farms spreading sand or sawdust steeped in paraffin on the drills gave remarkable results. The young turnips were bright green, strong, and numerous, while the untreated drills alongside showed a few weak plants paler in colour and dotted with light brown spots.

Careful observation showed that these spots were caused by a little *Ceutorhynchus* beetle, which attacks the cotyledons before they are above ground and just as they emerge from the seed coats. The spots are not due to "fly" or frost as is sometimes stated. The method of spreading sand or sawdust is, of course, expensive and impracticable; it was adopted to ascertain the effect of a strong-smelling material. In one trial only the farmer reported that steeping spoiled the braird. Spraying the surface of the drill seemed to produce no effect.

Sale of Inferior Seeds.

The Board of Agriculture consider it desirable again to call the attention of purchasers of farm and garden seeds to the provisions of the Adulteration of Seeds Acts of 1869 and 1878. Under these Acts it is a criminal offence to sell, or cause to be sold, any killed or dyed seed, or to kill or dye, or to cause

to be killed or dyed, any seeds. The term "to kill seeds" means to destroy by artificial means the vitality or germinating powers of such seeds. The term "to dye seeds" means to apply to seeds any process of colouring, dyeing, or sulphur smoking. Proceedings under these Acts against any persons in respect of selling, or causing to be sold, any killed or dyed seeds must be commenced within twenty-one days from the time of the commission of the offence.

Seeds for use on farms and market gardens should always be bought subject to a guarantee of genuineness and germination, and their germinating power should be tested to see whether the seeds come up to the standard guaranteed. The presence of dye or other colouring matter can usually be detected by rubbing the seed in soft white paper, or by washing a small quantity in water.

Foot-Rot in Sheep.

Foot-rot in sheep, which is the cause of much loss and inconvenience to farmers in this country, is also well known and greatly feared in many sheep-raising and sheep-feeding localities in the United States; and in connection with the experiments which are being conducted by the Board with a view of testing the efficacy of foot-baths as a remedy for this disease, a bulletin recently issued by the United States Department of Agriculture is of interest as showing the character of the solutions which have been found successful in America.

A considerable portion of the bulletin is devoted to a bacteriological account of the disease and a description of the experiments made to investigate its contagious character, followed by a statement of the few pathological conditions of the feet of sheep, which may at times be mistaken for contagious foot-rot. The bulletin concludes with some practical advice as to the prevention and treatment of the disease.

In regard to treatment, the authors of the bulletin, Dr. Mohler and Dr. Washburn, of the Bureau of Animal Industry, observe that one of the first steps to be taken is to separate all sheep that are in any degree diseased from those that are healthy. Should the disease be in its earliest stage, with but few animals

affected, it will be found sufficient for those that appear sound to pass through a shallow trough containing a solution composed of 1 lb. of chloride of lime to 12 quarts of water. This solution should have a depth of at least 4 in. in the trough, which may be made of wood, tightly constructed, 20 in. in width and a foot or more in depth. The length should be proportioned to the size of the flock to be treated. For small lots that are accustomed to being handled, the trough need not be over 6 ft. in length. In such cases, however, the animals should be allowed to stand for a few seconds in the solution before passing out. A greater length of trough would necessitate the preparation of a larger amount of fluid, and, consequently, would entail greater expense. Where a large number of sheep are to be treated the trough should not be less than 20 ft. in length. Hurdles may be arranged by the sides of the trough and along the pathway leading to it, so that each animal may be obliged to pass through the bath with but very little urging. Instead of the mixture of chloride of lime, a solution composed of 1 part of carbolic acid crystals to every 30 parts of water, or 1 lb. of pure carbolic acid to 4 gallons of water, may be used.

After this treatment has been applied to the sound part of the flock, they should be at once placed in fresh, uncontaminated quarters. In case the flock from which the healthy sheep were separated is badly diseased, it would be advisable to have the sound animals pass through the bath as described above on several occasions. This may be done on every second day until three or four treatments have been applied.

In regard to that portion of the flock in which disease has become actually established, it should be remembered that the principal requisites are to lay bare the affected surfaces and to destroy the infectious matter which has lodged in them. The bacteria to which the disease is due yield very rapidly to the application of disinfectants, and one must constantly aim while treating foot-rot to expose the diseased areas to the action of the disinfectant used. The treatment already suggested will be found very efficacious for early stages of the disease, but after the animal has become more seriously affected its feet should be carefully examined and all shredded or loosened portions of the horny tissue pared away. This will often prove to be

a very laborious undertaking, but the operator should persist until the loosened horn has been thoroughly removed and all the ulcerous fissures have been exposed.

The foot must be carefully cleaned and every portion of loosened and detached horn cut away, as the horny tissue once separated from the sensitive parts beneath will never unite with them again, but will remain as a source of pain and inflammation and also a protection for the disease-producing organisms while they attack and destroy the internal structures. Should fungoid granulations be met they should be removed with a knife or pair of curved scissors. All clippings and trimmings that are removed from the diseased feet, whether composed of bits of horn, shreds of tissue, or fungoid growths, should be carefully gathered up and burned or disinfected, as they may serve to spread the disease further if left where passing sheep may come in contact with them.

If this work has been thoroughly done, standing the sheep for ten minutes in a strong solution of copper sulphate (blue vitriol) made as warm as can be borne by the hand will in most cases effect a cure. This solution may be prepared by dissolving 4 lb. of copper sulphate in 5 gallons of warm water. The foot-bath should be repeated if necessary.

An attendant should remain stationed by the side of each sheep whose feet are badly affected to prevent the animal from lying down while it is in the copper-sulphate solution, as sheep of this class, because of the pain produced during their efforts to stand, are liable to drop to their knees or even to lie down in the trough during the application of the treatment. Soft bandages should be applied, after the sheep are removed from the foot-bath, to all feet that have required deep cutting, not only for the purpose of protecting the sensitive tissue from becoming bruised, but in order that particles of dirt may be kept from the raw surfaces and that nature may be assisted in the formation of new protective coverings.

It sometimes happens that the disease assumes an aggravated form in several of the sheep, involving the deeper sensitive tissues, and necessitating the application of hand dressings to the feet. In such cases all the loose and diseased tissue should be cut away, and the affected parts washed thoroughly with

a 5 per cent. solution of carbolic acid. An antiseptic astringent powder, consisting of 4 parts of carbolic acid, 2 parts of tannic acid, and 94 parts of dried alum, is then dusted upon the ulcerated surfaces, and a bandage applied to afford the parts the desired amount of protection.

In this connection it may be useful to reproduce here the directions which have been issued for the use of the foot-bath in the experiments which are being conducted by the Board of Agriculture in this country. They are as follows :—

The bath supplied is of wood 16 ft. long and 1 ft. wide. It should be put down dead level in such a position that the sheep can be easily guided into it. At first they may be a little averse to enter, but later they usually pass through quite freely. The narrow run in which the bath is placed should be wide enough to allow sheep to walk freely through. A width at 2 ft. from the ground of 18 in. will be found sufficient even for in-lamb ewes. Hurdles or a pale-fence should be erected along the sides of the bath, sloping outwards somewhat so as to give the necessary room. If the sides are close-boarded the sheep pass through the bath more freely.

Various substances are used for preparing the solution with which the bath is filled, but probably none is more effective or convenient than copper sulphate. The usual strength is 1 lb. dissolved in 2 gallons of cold water, but in the case of sheep badly affected double this strength may be employed. The solution should stand about 1 to 1½ in. in depth. Five pounds of copper sulphate in 10 gallons of water will give the necessary depth to start with. As the solution is strongly poisonous great care must be taken to prevent stock drinking it.

This treatment of foot-rot is chiefly valuable as a preventive, and the bath should be brought into use before many of the flock are visibly affected. As a rule treatment once a month is sufficient as a preventive, but animals badly affected should be kept apart from the others and be treated more frequently. In ordinary cases it is not necessary to dress the hoof with the knife, but if the feet are badly affected they should be pared and afterwards dressed with a paste prepared by mixing equal parts of copper sulphate and Stockholm tar, or by

holding the affected foot in the solution of copper sulphate contained in a small vessel.

A dry day should be selected for the operation, and the sheep should be allowed to stand in a hard dry fold for half an hour after leaving the bath.

Live Stock Import Regulations—New South Wales.*

According to Regulations dated 27th August, 1902, horses, cattle, sheep, and goats may be introduced into New South Wales from the United Kingdom. They must be shipped from London, Liverpool, or Glasgow, and must be landed at Sydney.

Any person intending to introduce foreign horses, cattle, sheep, or swine into New South Wales is to give the Chief Inspector of Stock not less than fourteen days' notice in writing as to the number, description, breed, colour, and sex of the stock, together with the name and address of the owner, the port of shipment and name of vessel, and the expected date of arrival. The exporter must make a declaration in the prescribed form before a Justice of the Peace, stating the period during which the stock have been his property or in his charge ; and to the effect that they are, and have been for the preceding six months, free from any infectious or contagious disease ; that they have not been in contact with, or on the same farm as, any infected stock ; that they have not, in the case of horses, been tested within the preceding two months with mallein for glanders ; nor, in the case of cattle, with tuberculin for tuberculosis. This declaration must also contain a statement by a veterinary surgeon that he has examined the stock referred to, and has no reason to doubt the correctness of the declaration in any particular.

Horses are to be tested with mallein by a properly qualified veterinary surgeon, and cattle with tuberculin, immediately before starting. The veterinary surgeon is to give a certificate bearing a full description of the animals, and stating that they have

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* Live stock import regulations have been published in this *Journal* for the following countries :—United States, Vol. X., No. 1, June 1903, and Vol. XI., No. 7, Oct., 1904 ; Argentina, Jan., 1905 ; Cape Colony, Feb., 1905 ; and Canada, March, 1905.

been examined and did not react to the test, and that they are in good health. The declaration and certificate are to be delivered to the official veterinary surgeon appointed by the State at the port of shipment.

All stock, prior to being put on board for shipment to New South Wales, must be carefully inspected at the owner's expense by a duly qualified veterinary surgeon appointed by the State.

Stock found on arrival to be infected will be destroyed or otherwise disposed of as directed by the Minister of Agriculture. All horses, cattle, sheep, and swine found on inspection to be free from infection are to undergo quarantine for the following periods:—Horses, 14 days; sheep, 30 days; and cattle and swine, 40 days. All sheep whilst in quarantine will receive two or more dressings with tobacco and sulphur, or with lime and sulphur, as the Chief Inspector shall direct. All expenses of quarantine and inspection are to be borne by the owner or consignee.

The following circular has been addressed by the Board to local authorities in Great Britain in connection with the Sale of Milk Regulations, 1901:—

Circular as to the Sale of Milk Regulations.

Board of Agriculture and Fisheries,
4, Whitehall Place, London, S.W.,
March 27th, 1905.

SALE OF FOOD AND DRUGS ACT, 1899.

SIR,—I am directed by the Board of Agriculture and Fisheries to advert to their circular letter of December 28th, 1901, of which a copy is herewith enclosed,* and to inform you that they have received numerous representations from dairy farmers and others complaining of the institution of proceedings under the Sale of Food and Drugs Acts, 1875 to 1899, in cases in which, as is alleged, the deficiency of milk-fat or milk-solids as compared with the limits laid down in the Sale of Milk Regulations, 1901, was due to accidental causes and not to any fraudulent action on the part of the vendor.

In the circular letter above referred to, the Board suggested that in the absence of any special circumstances indicating the

* A copy of this circular can be obtained on application at the Offices of the Board.

commission of fraud, the local authority might in the first instance call the attention of the vendor to the adverse report of the analyst and afford him an opportunity of submitting any explanation he might desire to offer on the subject. The Board further expressed the opinion that if the explanation were one which the local authority felt able to accept, they might, in the exercise of their discretion, refrain from the institution of proceedings, or withdraw any summons which it might have been necessary to take out in order to avoid the failure of proceedings, at the same time making arrangements for the taking of further samples of the milk supplied, in order that a satisfactory conclusion as to its character might be arrived at.

The experience of the past three years has confirmed the propriety of the views expressed by the Board on the subject, and they would be glad to learn that your local authority have made arrangements to proceed on the lines suggested, and if not, that the matter will be further considered at an early date.

I am also to say that the Board think it very desirable that farmers, dairymen, and all other cowkeepers should have samples of the milk of their cows tested from time to time, so that they may be able to watch the seasonal and other variations in the quantity of milk-fat contained in the milk, and by modifications in the feeding, housing, or time of milking, and if necessary by the disposal of animals giving milk of an exceptionally poor character, keep the quality of their milk at a satisfactory level. The Board have ascertained that with the object of assisting farmers thus to acquaint themselves with the character of their milk the various Agricultural Colleges and Agricultural Departments of University Colleges, &c., are willing to determine for a fee of sixpence the percentage of milk-fat in any sample of milk which may be sent to them from the counties with which they are respectively associated. Detailed information as to the arrangements thus made is given in the *Journal of the Board of Agriculture* for March, 1905. The Board would be glad if your local authority would co-operate with them in the matter, and do what is possible to facilitate the testing of milk in the manner proposed.

The Board are satisfied that if the keepers of cows will from time to time test the quality of their milk for themselves, and if

the local authorities will adopt some such arrangement as that above suggested for hearing what the vendor has to say for himself before taking the case into open Court, any legitimate ground of complaint on the part of producers as to the administration of the law, so far as the adulteration of milk is concerned, will speedily be removed.

I am, Sir,

Your obedient Servant.

T. H. ELLIOTT,

Secretary.

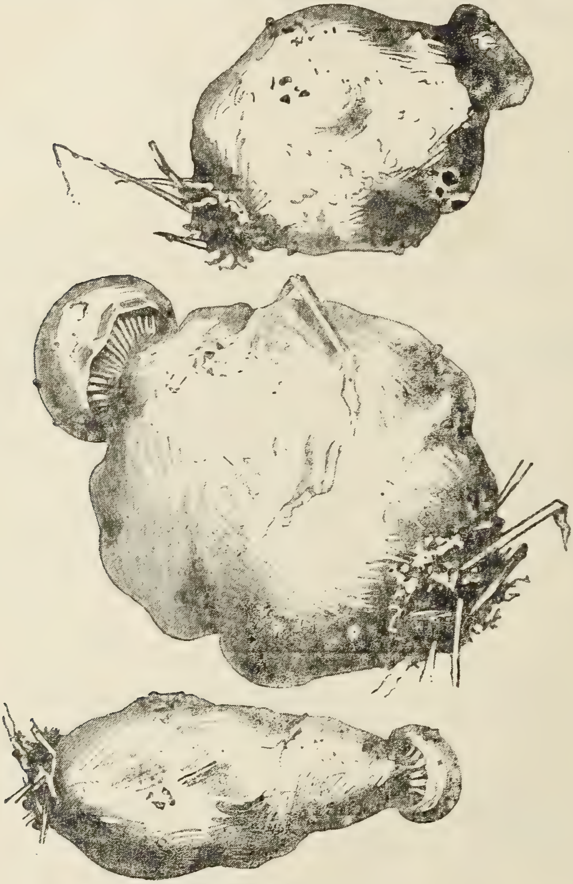
Tests for Farmers' Milk.

The Aberdeen and North of Scotland College of Agriculture have informed the Board that they have now made arrangements for the testing of farmers' milk in accordance with the conditions described in the previous number of this *Journal* (March, 1905, p. 743). It is proposed to fix the charge for each sample at 6d., and samples from the counties of Aberdeen, Kincardine, Banff, Elgin, Inverness, and Ross and Cromarty, will be tested at this rate. Samples of milk taken in accordance with the instructions should be addressed to James Hendrich, B.Sc., F.I.C., Marischal College, Aberdeen.

A Mushroom Disease (*Hypomyces perniciosus*).

During certain seasons cultivated mushrooms are destroyed in a wholesale manner by this disease, not merely in this country but also on the Continent; more especially in the neighbourhood of Paris, where mushroom culture is conducted on a very extensive scale. The primary cause of the mischief is a minute parasitic fungus, which when once introduced, spreads very quickly under the conditions of temperature and moisture essential for the rapid growth of mushrooms. Well marked symptoms are evident from the earliest stages of disease, the mycelium of the parasite growing up with that of the mushroom, and the latter, instead of gradually developing into a cap and stem, becomes an irregularly-shaped monstrous soft mass, which if allowed to grow, often exceeds in size that of a full-grown mushroom. Sometimes a

small, deformed cap is present, but as a rule the entire mass of a diseased mushroom consists of a much swollen stem. After a time the parasite forms its spores on the surface of the diseased mass, appearing under the form of a snow-white, minutely velvety covering. After the spores are scattered the diseased



DISEASED MUSHROOMS.

mushroom rapidly decays, forming a putrid mass having a very disagreeable, pungent smell.

Numerous toadstools and other fungi suffering from the parasitism of different kinds of *Hypomyces* are common in our woods and pastures every season, and spores are probably introduced into the mushroom bed along with the manure or road sweepings commonly used. In some instances it is perfectly certain that the spawn is infected before it is placed in

the mushroom bed. In such cases, when the spawn commences to "run," the threads, instead of having a clear and sharp outline like white cord, present a fluffy appearance, due to the presence of the parasite on the surface of the strands; the branches are also much fewer in number than when the spawn is healthy and growing vigorously.

Under such circumstances the entire bed should be removed before the parasite produces spores, otherwise if the house becomes thoroughly infected, common experience has shown that the disease is exceedingly difficult to eradicate.

When infection occurs through the introduction of spores into the house by wind or other causes, the disease may be confined to certain portions of the bed, and the prompt removal of infected mushrooms as soon as the slightest symptoms are observed may check the disease from assuming the proportions of an epidemic.

After removing the soil and manure of an infected bed, great care should be taken in the cleansing of tools, boots, and even clothing; otherwise the risk of infecting other beds is great. Rejected soil and manure should be at once removed from the neighbourhood of mushroom beds. They may be applied to the land, as the contained spores, so far as is known, can only develop on some kind of fungus, and do not attack any other cultivated crop.

When a house or other structure in which mushrooms are grown has become infected, it should be completely emptied and thoroughly sprayed, both roof, walls, and floor, three times at intervals of ten days with a solution of sulphate of copper—one pound of the sulphate to fifteen gallons of water.

During this period of spraying the house should be kept warm and moist, for the purpose of favouring germination of the spores of the parasite, which are destroyed with greater certainty when growing than when in a resting condition.

Insects on Osiers and Willows.

Willows grown at Kew Gardens have recently been attacked by the larvæ of *Cecidomyia saliciperda*. Of *Cecidomyidæ*, or Gall-Gnats, which attack trees, the most noteworthy and harmful are the species which infest willows. The place and mode of attack on the willow vary with the species of gall-gnat;

some cause galls on the leaves, others at the ends of twigs, others give rise to swellings on very young twigs; while the species in question attacks thicker branches, up to, it may be, the thickness of one's arm.

Cecidomyia saliciperda, Duf.—This gall-gnat measures only 3 mm. in length and 7 mm. in spread of wing. The insect is dark coloured, and covered with black hairs; the sides of the abdomen are reddish. The antennæ are whitish, and the wings are white and have white hairs, as also have the legs. The larva or maggot is yellowish or orange-coloured.

Life History.—Eggs are laid in chains on the bark in May in an average season, and the larvæ on hatching penetrate below the bark. By the time the cambium has been reached, it has begun to give rise to the new wood of the year; but the irritating presence of the gall-gnat maggots causes it to form irregular growths, through which the maggots make chambers or tunnels. For a time the bark is able to accommodate itself to the increased growth without bursting, but at last it gives way and peels off or hangs down in strips, exposing the larval chambers in the browned wood. The larvæ live in these chambers till they attain their full growth in the month of April of the year following their hatching. When full grown they pupate near the outside of the chamber, and in May (or April, according to the temperature,) the adults issue.

Attack has been noticed on *Salix alba*, *S. viminalis*, *S. triandra*, *S. purpurea*, *S. caprea*, and on White Poplar.

Remedial Measures.—1. A careful observer, familiar with the work of the fly, can recognise the swellings before these have burst; they are recognisable early, especially on willows with lighter coloured barks. The twigs where these swellings are noticed should be cut away.

2. The attack generally, however, will not have been observed until a comparatively late stage, in which case there should follow a thorough cutting away of attacked branches so as not to leave any of the pests behind. The branches cut away must not be allowed to lie on the ground as the brood may mature in them.

3. Infected places can be painted over with tar and some sticky material. This will prevent the escape of a new brood.

Sometimes the pupa succeeds in pushing out through the dressing, but the escaping adult gnat is caught in the sticky material.

As pupation is generally in April, remedial measures should not be delayed, but be undertaken immediately so as to prevent the issue of a new brood of gall-gnats which would at once proceed to egg laying, followed by another generation.

Willows have also been attacked in Berkshire by a beetle known as *Galeruca lineola.* The attack is not noticeable till the end of June, when the osiers are about 3 ft. high; the eggs are then deposited on the leaves, and in a few weeks the resulting maggot causes much damage by devouring the leaves and top of the rod.

The remedial measures suggested are:—(1) Collect the beetles in their winter quarters and burn them. (2) Where possible, flood the ground in winter, and place pieces of bark and planks of wood a little above the flooded ground; great numbers of the beetles driven out of hiding will collect on these and can be destroyed. (3) Shake down the beetles in spring and during the season into vessels containing a little paraffin. (4) Pick off and destroy the larvæ. The use of the following spray is also recommended:—1 oz. pure arsenate of soda, dissolved in a little water; 3 oz. acetate of lead (sugar of lead), dissolved in a little water; pour both of these into 16 gallons of *soft* water (rain water), and add 1 lb. of treacle. If this mixture be sprayed on the young shoots and leaves, it will poison any beetles or larvæ that may feed on them.

Earnings of Agricultural Labourers.

The wages, earnings, and conditions of employment of agricultural labourers in the United Kingdom, which were investigated by the Board of Trade in 1898,* are dealt with in a second Report [Cd. 2376] recently prepared by Mr. Wilson Fox, C.B., of the Labour Department, in which particulars are given for 1902, together with a mass of interesting information as to the cash wages paid on a considerable number of farms for a long series of years, the food consumed by farm labourers, and

* See *Journal*, Vol. VII., p. 170, and Vol. VIII., p. 71.

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their expenditure on rent, clothes, fuel, tobacco and alcohol, their working hours, together with detailed descriptions of the conditions of labcur on certain farms.

The average weekly earnings, including the value of all allowances in kind, of ordinary agricultural labourers rose between 1898 and 1902 in all parts of the United Kingdom as follows:—

	1902.	1898.
	s. d.	s. d.
England	17 5	16 9
Wales	17 7	16 6
Scotland	19 5	18 2
Ireland	10 9	10 2

The earnings were usually highest near the large industrial or mining centres ; in England, the highest weekly average was reached in Durham (22s. 2d.) ; in Wales, in Glamorgan (21s. 3d.) ; in Scotland, in Renfrew and Lanark (22s. 2d.) ; and in Ireland, in Down (13s). Oxfordshire showed the lowest average weekly earnings in England, viz., 14s. 6d. ; the counties where the earnings were next lowest were Norfolk (15s. 3d.), Gloucestershire (15s. 5d.), and Suffolk and Dorset (15s. 6d. each). The county where the earnings were lowest in Wales was Cardiganshire (15s. 8d.), and in Scotland the minimum was reached in a group comprising Shetland, Orkney, and Caithness (13s. 7d.).

The increase in the wages of agricultural labourers during the past fifty years has been very marked. Information has been obtained from sixty-nine farms in England and Wales of the cash wages actually paid to ordinary agricultural labourers, exclusive of piecework, harvest money, overtime, and allowances in kind, which shows that the weekly wages increased from 9s. 3½d. in 1850 to 14s. 7d. in 1903 in England and Wales. In the case of Scotland returns were available from only six farms, but they indicate that wages in 1850 were rather less than one-half of what they are at the present time, while returns from ten farms in Ireland show a rise from 5s. 10½d. in 1850 to 10s. 4½d. in 1903, an increase of 4s. 6d., or 76·6 per cent.

Examples of the class of food eaten by farm labourers are given as illustrations of the customs prevailing in different districts, and it is estimated that the average weekly value of food consumed, including articles purchased and those produced at home, by a man, his wife, and four children, is 13s. 6½d. in

England, 15s. 2½d. in Scotland, and 10s. 5¾d. in Ireland. The rent usually paid in purely rural districts in England and Wales is between 1s. and 2s. a week, 1s. 6d. a week being the rent most frequently paid. In the neighbourhood of towns or collieries, however, it is more. In Scotland, most of the married farm servants are given their cottages free as part payment of wages. In Ireland, the most usual rent for labourers' cottages is 1s. a week.

Agricultural Education and Forestry Exhibition at Park Royal.

The Royal Agricultural Society announce that an Agricultural Education and Forestry Exhibition will again be held in connection with the Society's Show at Park Royal from June 27th to 30th.

The forestry department will be organised on the same general lines as last year, and offers of exhibits are invited for the following sections:—

1. Seeds and cones of trees and shrubs.

2. Seedling trees and transplants, consisting of specimens and plants suitable for woods, plantations, coverts, shrubberies, &c.; plants suitable for agricultural hedgerows, with illustrations of planting; and collections of willow plants for industrial purposes (cricket bats, basket-making, &c.).

3. Woods and plantations, chiefly photographs and diagrams, showing systems of treatment as to mixing, thinning, &c. Photographs of historic or specimen trees.

4. Timbers. Planks and hand-specimens of home-grown woods of various species; specimens of timber, &c., showing the effects of pruning, injuries, &c.; specimens of timber showing the effects of creosoting and of other methods of preservation; articles in process of manufacture from home-grown timber.

5. Insects and diseases. Specimens of forest insects and of fungi and their ravages; characteristic examples of the attacks of game, birds, squirrels, voles, &c.

6. Plans, maps, models, &c., illustrating working plans, forest exploitation, manipulation of timber, &c.

7. Forest and nursery tools, instruments, and appliances.

Any offers of exhibits, or inquiries should be addressed to the Secretary of the Society, at 13, Hanover Square, London, W.

Prices of Ordnance Survey Maps.

The prices of the regular series of one-inch and smaller scale maps have recently been revised, and in future will be as follows:—

Map.	Unmounted folded or unfolded.	Mounted folded or unfolded.	Mounted to fold in sections.
16 miles to 1 inch—United Kingdom...		See Below.	
10 ,, ,, Great Britain ...	1s.	*—	2s.
4 ,, ,, England and Wales	1s. 6d.	2s.	3s.
4 ,, ,, Scotland	1s.	1s. 6d.	2s.
4 ,, ,, Ireland	1s.	1s. 6d.	2s.
2 ,, ,, England and Wales	1s. & 1s. 6d.	1s. 6d. & 2s.	2s. & 3s.
2 ,, ,, Scotland	*1s. 6d.	*2s.	*3s.
1 Inch Scale—England and Wales ...	1s. & 1s. 6d.	1s. 6d. & 2s.	2s. & 3s.
,, ,, Scotland	1s. 6d.	*2s.	3s.
,, ,, Ireland	1s.	1s. 6d.	2s.

Where paper copies of maps published printed on linen-backed paper are not available, the price will be that quoted for unmounted copies.

The prices of the larger scale maps, which have not been altered, are as follows:—

Large Scale Maps—

6 in. to a mile	...	2s. 6d. per sheet, 36 in. by 24 in. 1s. per quarter sheet, 18 in. by 12 in.
25 in. to a mile	...	2s. 6d. and 3s., 38 in. by 25 in.
Town plans ...	...	2s. 6d., 38 in. by 25 in. and 36 in. by 24 in.

A leaflet describing the different series of Ordnance Survey maps, with particulars as to their issue and price, can be obtained on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.

Library of the Board of Agriculture.

The Board of Agriculture and Fisheries have a large number of books in their library on matters relating to practical, scientific, and economic agriculture, as well as fairly complete sets of reports on experiments conducted in Great Britain. These books and reports may be consulted at the offices of the Board, 4, Whitehall Place, London, S.W., on any week-day, between the hours of 11 a.m. and 5 p.m. (Saturdays 11 a.m. to 2 p.m.). Application should be made to the Intelligence Branch, one of whose officers will, if desired, assist the visitor in finding any information required.

* These maps have not yet been issued.

Importation of Pedigree Stock into Argentina.

By a Decree of the Argentine Government, dated March 1st, 1905, the pedigrees of imported animals must, in future, be produced at the time of their quarantine examination, together with a statement of marks of identification. The Inspector of Imports will register all the particulars furnished—name, sex, breed, date of birth, number and date of entry in the pedigree stock book—as well as the marks of identification, and when the sanitary requirements have been complied with, will return the pedigree to the owner, endorsed with its number in his official register, and a statement as to the acceptance or rejection of the animal.

A summary of the general Argentine Regulations was given in this *Journal* for January, 1905 (Vol. XI., p. 615).

Two Great Continental Agricultural Societies.

The two largest Agricultural Societies on the Continent are the Société Nationale d'Agriculture de France and the Deutsche Landwirtschaftliche Gesellschaft. The former claims to be the oldest agricultural society in existence, since it has a continuous record of 150 years. The latter may be considered one of the largest, since it numbers over 14,000 members. Both these societies have not long ago held their annual meetings, and the reports* of the proceedings have been recently published. The methods of the two bodies differ in some degree, though the object of these reunions is alike in either case, namely, a general survey of the year's work. The record of the French society is set out in a report by their Permanent Secretary, M. Louis Passy, and is prefaced by a eulogy of Pasteur, his colleagues and successors, and an account of the many and great services they have rendered not only to French agriculture but to that of the whole world as well. The report recapitulates the many bulletins or communications that have been received from the members of the society during the year, among which the

* Bulletin de la Soc. Nat. d'Agric., 1904, No. 11 ; Mitt. der Deutschen Land. Gesellschaft, 18 Feb., 1905.

most interesting or important have been M. Vilmorin's annual report on potato growing; the report on the new potato, *Solanum Commersonii;* M. Hélot's report on sugar beet culture; M. Bouquet de la Grye's report on the parasite of the woolly aphis; M. Vacher's communication on the subject of a new herd-book for Pyrenean cattle; some references to the use of sugar products in cattle feeding; and notices of certain works on the economics of agriculture, rural depopulation and finance. Communications were also made on vine growing, forestry, Colonial products (cotton, rice, &c.), and the manufacture of alcohol. The French communications are all the work of individuals, and no mention is made of any subject being relegated to any deputed body for consideration and report. The German society, on the other hand, is divided into a large number of general and special committees, a short account of whose work is given. Among others, the following may be noticed as giving an indication of the direction in which the attention of the society is turned: the special committees on soil-bacteriology, on tobacco manuring, the cultivation of moorlands, agricultural labour (dealing with land colonies); departments of seed cultivation, tillage, cattle rearing, land cultivation (dealing with irrigation), implements, farm-buildings, and the newly-created department of farm management (Betriebswesen), which apparently proposes to enquire into the conditions of the business side of farming in Germany and develop the already considerable assistance rendered by the society in this respect to individual farmers. Seeds and manures are also purchased from the society. The sittings of the conference lasted several days, during which papers on various subjects of special interest to German agriculturists were read.

Sale of Bound Volumes of the "Journal."

ADDITIONS TO THE LIBRARY DURING MARCH.

Africa—

Cape of Good Hope.—Agricultural Department Re-organisation Commission. First Report. (14 pp.) 1904.

East Africa Protectorate.—Report on Pastoral and Agricultural Capabilities. (23 pp.) 1904.

Natal.—Conservator of Forests. Report for 1902 (24 pp.), and for Jan. 1903—June 1904. (67 pp.)

British East Africa.—Agricultural Department, Settler's Prospects. (19 pp.) 1905.

Australasia—

New Zealand.—Sheep Returns for year ended 30th April, 1904. (141 pp.)
Statistical Account of Australia and New Zealand, 1903-4. (1,042 pp.)
South Australia.—Ministry of Agriculture, Report, 1903-4. (22 pp.)
South Australia.—Statistical Register, 1903.

Austria-Hungary—

Bericht über das Österreichische Veterinärwesen, 1891-1900. (275 pp. + 33 plates.)

Österreichisches Statistisches Handbuch, 1903. (476 pp.)
Jahresbericht über das Veterinärwesen in Ungarn, 1903. (110 pp.)

Belgium—

Exposé statistique de la situation des Associations d' Intérêt Agricole, 1903. (63 pp.)

Doren, V. V.—Annuaire des Laiteries et de l'alimentation agricole Belge. (257 pp.) 1905.

Canada—

Haldane, J. W. C.—3,800 miles across Canada. (344 pp.) 1900.
Nova Scotia.—Secretary for Agriculture, Report, 1904. (246 pp.)
Department of Agriculture.—Central Experimental Farm. Results obtained in 1904 from Trial Plots of Grain, Fodder, Corn, Field Roots, and Potatoes. (58 pp.) 1905.

Denmark—

Statistik Aarbog, 1904. (199 pp.)
Buer, Dr. H.—Die dänischen Kontrollvereine und Zuchtcentren. (64 pp. + 6 plates.) Berlin, 1902.

France—

Sidersky, D.—La Genèse des Distilleries Agricoles. (46 pp.) 1904.
Fritsch, J.—Fabrication de la Margarine et des Graisses alimentaires. (276 pp.) 1905.
Passy, L.—La Société nationale d'Agriculture de France et les Méthodes Pastoriennes. (36 pp.) 1905.
Leroux, E.—Pommes à Cidre de la Thièrache et de l'Aisne. (115 pp.) 1904.

Germany—

Hollrung, Dr. M.—Jahresbericht über die Neuerungen und Leistungen auf dem Gebiete der Pflanzenkrankheiten, 1903. (374 pp.)
Appell, Dr. O.—Beispiele zur mikroskopischen Untersuchung von Pflanzenkrankheiten.
Die landwirtschaftlichen Versuchs-Stationen. Band LXI. 1905.
Hansen, Dr. J., und Hermes, A.—Die Rindviehzucht im In-und Auslande, 2 vols. (667 + 396 pp.) 1905.

Great Britain—

Statistical Abstract for the British Empire, 1899-1903. (110 pp.) [Cd. 2395.]
Lancaster C.C. Education Committee.—Experiment on varieties of Potatoes, Report. (8 pp.) 1905.
Civil Service and Revenue Departments. Appropriation Accounts, 1903-4. (652 pp.) [H.C. 37.]
Liverpool School of Tropical Medicine.—Reports of the Trypanosomiasis Expedition to the Congo 1903-4. (205 pp.)
Bedfordshire C.C.—Report upon the Demonstration Plots, 1904. (14 pp.)

Great Britain—*Continued.*

Royal Agricultural Society of England.—Journal, Vol. 65. 1904. (392 + clxvi. pp.)
International Co-operative Alliance.—Report of 6th Congress, Buda Pesth, Sept., 1904. (607 pp.)
Collinge, W. E.—Report on the Injurious Insects and other Animals observed in the Midlands, 1904. (69 pp.)
Board of Trade.—Return, Differential Duties. (189 pp.) [Cd. 2394.] 1905.
Board of Trade.—New German Tariff as modified by Treaties. (227 pp.) [Cd. 2414.] 1905.
Tegetmeier, W. B.—Poultry for the Table and Market. (135 pp.) 1898.
Hubbard, A. J., and G.—Neolithic Dew-Ponds and Cattle-Ways. (70 pp.) 1905.
Journal of the British Dairy Farmers' Association, vol. xix., 1905. (193 pp.)
University College of South Wales and Monmouthshire Calendar, 1904–5. (427 pp.)
Estimates for Civil Services for year ending 31 March, 1906. (534 pp.) [H.C. 64.]
University of Leeds.—Report on Tests with Varieties of Oats and Barley at Garforth, 1904. (18 pp.) 1905.

Holland—

Departement van Waterstaat, Handel en Nijverheid. Lijst van Vereenigingen op Land-en Tuinbouwgebied. (85 pp.) 1905.
Luxembourg.—Troisième Complément de la Statistique Générale sur l'Administration du Service Agricole. 1 Jan., 1900, au 1 Jan., 1904. (85 pp. + 9 diagrams). 1905.

India—

Department of Agriculture, Bengal.—Agricultural Statistics, 1903–4. (45 pp.)
Department of Agriculture, Bombay Presidency.—Annual Report, 1902–3.
Department of Agriculture, Central Provinces.—Report for year ending 31st March, 1904.
Board of Scientific Advice.—Report, 1903–4. (22 pp.)
Lingard, A.—Report on Dourine in different breeds of Equines. (84 + xcix. pp. + 16 plates.) 1905.
Punjab Veterinary College, Lahore.—Note on Dourine or Maladie du Coit. (28 pp.) 1902. Further Notes. (16 pp.) 1903.

Italy—

Andreotti, I.—L'Assicurazione contro i danni della mortalità e del deperimento del Bestiame Agricolo. (39 pp.) 1904.
Sallucci, A.—Sindacati Agrari Cooperativi. (93 pp.) 1904.
Annali di Agricoltura, 1905. Legislazione vigente sulla Pesca al 1° Gen., 1905. (174 pp.)

Russia—

Ministre des Finances.—Budget de l'Empire pour l'Exercice, 1905. (84 pp.)
Finland.—Fattigvården i Finland, år 1901. (111 pp.) 1905.

Spain—

Moreno, R.—Las Cajas Rurales, El Crédito Agrícola, La Cooperación, El Ahorro, El Problema Agrario. (409 pp.) 1904.

United States—

Vuyst, P. de.—Notes sur l'Agriculture aux États-Unis. (109 pp.) 1905.
Department of Agriculture.—Appropriation Act, year ending June, 1906. (26 pp.)
Department of Agriculture.—Annual Reports, year ended June, 1904. Report of the Secretary of Agriculture, Departmental Reports. (560 pp.)
Bureau of Chemistry.—Co-operative work on the Titer Test, 1904. (16 pp.)
Farmers' Bulletin No. 212. The Cotton Bollworm. (32 pp.) 1905.
Bureau of Forestry.—Bull. 54. The Luquillo Forest Reserve, Porto Rico. (52 pp.) 1905.
Bureau of Plant Industry.—Bull. 66. Seeds and Plants imported from Sept., 1900, to Dec., 1903. (333 pp.) 1905.
Bureau of Statistics.—Circ. 16. Foreign Trade in Farm and Forest Products, 1904. (19 pp.)
Weather Bureau.—Bull, 35. Long-Range Weather Forecasts. (68 pp.) 1904.
University of Illinois.—Circ. 76. Improvements of Dairy Herds. (15 pp.) 1904.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of March, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 7	7 4	36 9	33 11
Herefords	7 9	7 0	—	—
Shorthorns	7 5	6 11	35 7	33 1
Devons	7 9	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¾	7¾	8¾	7¼
Sheep :—				
Downs	9	8½	8½	7¾
Longwools	8¾	8	8¼	7¼
Cheviots	9½	8½	9	8¼
Blackfaced	9	8¼	8¾	7¾
Cross-breds	8¾	8¼	9	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 3	5 11	6 5	5 9
Porkers	6 10	6 5	7 0	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 7	17 4	21 5	17 10
,, —Calvers ...	19 19	16 13	18 16	16 4
Other breeds—In Milk ...	18 13	15 8	18 9	15 8
,, —Calvers ...	14 10	13 4	18 11	15 12
Calves for Rearing	2 3	1 13	2 11	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	9 8	8 3	9 17	7 15
,, Two-year-olds	13 0	11 2	14 10	12 10
,, Three-year-olds	16 1	14 7	16 12	14 5
Polled Scots—Two-year-olds	—	—	16 2	13 15
Herefords— ,,	15 8	13 10	—	—
Devons— ,,	12 16	11 8	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	45 9	40 7	—	—
Scotch Cross-breds ...	—	—	36 9	32 10
Store Pigs :—				
Under 4 months	26 10	20 3	23 9	16 9

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	51 4	51 0	50 2	51 0	52 5*	51 7*
	2nd	49 0	45 6	45 6	43 9	47 5*	46 11*
Cow and Bull ...	1st	—	42 7	42 7	42 0	42 0	39 1
	2nd	—	37 4	37 11	33 3	37 4	33 6
U.S.A. and Canadian :—							
Birkenhead killed	1st	48 1	48 8	46 8	46 11	46 8	45 6
	2nd	44 11	43 9	42 0	39 8	44 4	35 5
Argentine Frozen—							
Hind Quarters ...	1st	25 8	25 8	25 8	26 3	28 0	27 5
Fore ,, ...	1st	22 5	24 2	22 9	22 5	25 8	25 8
Argentine Chilled—							
Hind Quarters ...	1st	35 0	36 2	35 7	32 8	—	37 4
Fore ,, ...	1st	27 5	28 0	30 4	24 6	—	28 7
American Chilled—							
Hind Quarters ...	1st	50 9	46 11	47 3	44 11	47 6	48 1
Fore ,, ...	1st	32 8	33 10	33 10	31 9	34 5	35 0
VEAL :—							
British	1st	74 8	68 10	72 11	74 1	—	—
	2nd	60 8	56 0	61 10	62 5	—	—
Foreign	1st	74 8	—	59 6	63 0	—	63 7
MUTTON :—							
Scotch	1st	75 3	—	78 2	77 0	74 1	69 1
	2nd	66 6	—	71 2	67 1	62 5	56 10
English	1st	66 6	67 4	71 9	72 4	—	—
	2nd	59 6	55 5	63 7	63 0	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	72 4	61 10	66 6	63 10	56 0	—
Argentine Frozen ...	1st	33 3	33 3	33 3	31 2	34 1	33 3
Australian ,, ...	1st	28 7	30 4	33 3	38 7	35 0	—
New Zealand ,, ...	1st	43 2	42 7	44 11	42 0	38 1	—
LAMB :—							
British	1st	109 8	100 4	102 8	—	—	—
	2nd	92 2	84 0	98 0	—	—	—
New Zealand ...	1st	59 6	59 9	59 6	60 8	63 0	63 0
Australian	1st	46 8	48 1	44 4	45 6	46 8	—
Argentine	1st	43 9	45 2	43 9	43 5	39 8	46 8
PORK :—							
British	1st	61 10	59 2	58 11	58 4	51 11	56 0
	2nd	50 9	51 11	51 4	47 10	48 5	47 3
Foreign	1st	59 6	49 7	50 2	51 4	—	48 3

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1905, and in the corresponding Weeks in 1904 and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9		21 6	22 6		17 3	16 4	
,, 22 ...	26 1	27 9		21 9	22 0		17 9	16 4	
,, 29 ...	26 10	27 8		22 1	21 1		18 0	16 3	
May 6 ...	27 6	27 4		21 10	20 8		18 2	16 7	
,, 13 ...	27 9	27 1		22 5	19 10		18 4	16 6	
,, 20 ...	27 10	26 9		23 7	20 4		18 5	16 7	
,, 27 ...	27 8	26 9		23 7	19 8		18 5	16 7	
June 3 ...	27 6	26 10		23 10	18 8		18 4	16 8	
,, 10 ...	27 8	26 6		21 5	18 5		18 7	16 10	
,, 17 ...	27 6	26 5		20 7	18 2		18 3	16 8	
,, 24 ...	27 6	26 5		22 0	19 2		18 6	16 10	
July 1 ...	27 9	26 4		20 7	18 8		18 6	17 1	
,, 8 ...	28 1	26 6		19 11	19 8		18 3	17 1	
,, 15 ...	28 3	26 10		20 5	18 9		18 7	17 6	
,, 22 ...	28 7	27 7		20 10	18 10		18 5	17 6	
,, 29 ...	28 11	28 0		21 0	19 9		18 6	17 10	
Aug. 5 ...	29 3	28 3		20 1	19 9		18 8	17 10	
,, 12 ...	29 11	28 4		21 3	19 9		18 10	17 7	
,, 19 ...	29 9	28 8		20 4	22 5		18 6	16 7	
,, 26 ...	30 0	29 5		22 3	23 2		18 7	16 5	
Sept. 2 ...	30 3	30 2		22 5	25 3		18 5	16 3	
,, 9 ...	28 6	30 0		22 4	24 10		17 0	16 1	
,, 16 ...	27 5	29 7		24 2	24 9		16 4	15 11	
,, 23 ...	27 0	29 10		24 0	25 10		16 2	15 9	
,, 30 ...	26 3	29 10		23 9	25 5		15 9	15 8	
Oct. 7 ...	25 10	30 2		23 8	25 6		15 6	15 9	
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ...	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1904.	Wheat. 1905.	Barley. 1904.	Barley. 1905.	Oats. 1904.	Oats. 1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	February ...	35 10	39 11	22 5	23 8	16 9	18 10
	March ...	37 1	39 10	22 5	24 0	16 10	19 4
Paris:	February ...	35 9	40 3	22 2	24 4	17 4	19 4
	March ...	37 4	40 2	21 9	25 0	16 1	19 11
Belgium:	February ...	29 7	30 0	21 0	23 5	15 4	19 10
Berlin:	January ...	35 7	38 7	—	—	18 3	20 1
Breslau:	January ...	34 0	36 5	23 0	25 7	16 1	19 6

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of March, 1904 and 1905.

—	Wheat. 1904.	Wheat. 1905.	Barley. 1904.	Barley. 1905.	Oats. 1904.	Oats. 1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	29 0	32 1	20 10	24 5	17 2	17 9
Norwich	29 3	31 2	21 11	25 0	15 9	16 6
Peterborough ...	27 9	30 3	20 8	23 7	15 6	16 7
Lincoln	27 10	29 8	22 1	23 5	16 4	16 5
Doncaster	27 6	29 1	24 10	24 1	16 8	16 2
Salisbury	28 8	30 3	22 1	25 1	16 7	17 0

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	13 6	12 6	—	—	—	—	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	104 6	102 0	—	—	—	—	—	—
Danish ...	111 0	109 0	113 6	110 0	113 6	111 6	110 6	—
Russian ...	104 0	102 0	109 0	106 0	—	—	—	—
Australian ...	105 0	103 0	105 6	104 0	106 6	104 6	107 0	—
New Zealand...	106 0	105 0	106 6	104 6	109 0	107 0	108 0	—
CHEESE :—								
British, Cheddar	72 6	60 0	—	—	68 0	62 0	58 0	54 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	71 6	62 6	73 0	64 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	56 0	55 0	55 0	53 6	55 0	53 6	56 0	53 0
BACON :—								
Irish	65 6	60 6	64 0	60 6	63 6	58 6	61 6	58 0
Canadian ...	52 0	49 6	50 0	46 0	49 6	45 6	50 0	47 0
HAMS :—								
Cumberland ...	96 6	80 0	—	—	—	—	—	—
Irish	90 6	75 6	—	—	—	—	86 0	76 0
American (long cut) ...	45 0	43 0	44 0	40 0	45 0	41 6	45 0	43 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	8 10	7 3	—	—	—	—	—	—
Irish	8 4	7 1	7 10	7 3	7 7	7 2	6 11	6 8
Danish ...	8 5	7 3	8 11	7 5	—	—	7 11	7 0
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	50 0	41 0	42 0	35 6	40 0	35 0	—	—
British Queen	62 6	55 0	—	—	—	—	—	—
Up-to-Date ...	62 0	52 6	58 0	46 6	41 6	36 6	43 0	40 6
HAY :—								
Clover... ...	83 6	72 6	81 0	66 6	80 0	67 6	71 0	65 0
Meadow ...	72 0	55 6	67 6	61 0	57 6	45 0	68 6	62 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MARCH.		3 MONTHS ENDED MARCH.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	68	110	155	320
Swine Slaughtered as diseased or exposed to infection ...	414	648	755	1,870
Anthrax :—				
Outbreak	117	106	277	270
Animals attacked	150	144	420	370
Glanders (including Farcy) :—				
Outbreaks	107	155	285	369
Animals attacked	233	270	561	717
Sheep-Scab :—				
Outbreaks	139	189	547	943

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MARCH.		3 MONTHS ENDED MARCH.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	2	11	6	29
Swine Slaughtered as diseased or exposed to infection ...	9	243	196	672
Anthrax :—				
Outbreaks	2	2	2	2
Animals attacked	2	2	2	2
Glanders (including Farcy) :—				
Outbreaks	3	—	9	2
Animals attacked	11	8	23	17
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	33	71	179	295

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XII. No. 2.

MAY, 1905. [NEW SERIES.]

FENCES AND HEDGES.

Hedges and their management would seem to the inexperienced a work of minor importance in estate management, but this is not altogether the case. Landed proprietors and their agents, farmers, and others interested in estates, agree that one of the difficulties with which they have to contend is the growth and maintenance of hedges and fences. The difficulty is often increased on estates where everything is done to keep the fences in good order by neighbours who own boundary fences paying little or no attention to their maintenance.

Parts of the country are now practically denuded of thorn hedges, whereas a little timely assistance on the part of the landlord and the tenant might have preserved many good thorn fences. When it is considered how much it costs to put in a thorn hedge, to put up guard fences and to keep the latter in proper condition for twelve or fifteen years (the time it takes to rear a thorn hedge strong enough to turn heavy stock), this alone ought to be an inducement to all concerned to take care of those hedges which are in fairly good growing condition. Fences erected as boundaries between farms should always be well kept up, more especially those marking the boundaries of estates, as it must not be forgotten that good boundary fences play an important part in determining a peaceful condition of things between neighbouring farmers.

There are several causes that tend to produce ill-kept thorn hedges. Owing to the small returns for growing cereals, much

land has been laid down to grass, and in many cases several fields have been laid together. A division fence being no longer required, the thorn has been allowed to assume a tree-like form for the purpose of shelter, and the hedges as far as up-keep is concerned have been ignored. The desire for shelter is frequently the cause of thorn fences being entirely ruined, even when an attempt is made at repairs with the object of retaining the division fence. The thorn being a light-demanding plant, when allowed to grow tall very soon loses its bottom growth through being shaded by the spreading top growth. Having lost its bottom growth, it no longer acts as a fence, and in this condition gives cattle and sheep easy access to the bare stems, and what with rubbing the thorns, and the treading away of the soil by the animals, a considerable amount of damage is done, and much staking up is necessary to make the fence useful against stock.

These ill-effects are noticeable in badly switched or dressed fences. When fences are switched every year with little or no attention as to how they are cut or the proper shape they ought to assume, the growth at the base is entirely ruined or severely checked by an ill-shaped, top-heavy hedge. Another cause of badly-grown fences is the want of proper protection to fences newly cut and layered. They ought to be protected for at least three years, and be kept free from weeds.

In the letting of farms a clause is often inserted in the agreement to the effect that the tenant after having had the fences handed over to him in proper condition must undertake to manage the same in such a manner that when he leaves the farm they may be found in the same state as when he entered. During the last fifteen or twenty years, however, farming has not been very profitable, and frequently the landlord has not compelled the tenant to fulfil the agreement respecting the up-keep of fences. The law affecting fences has also a connection with their bad condition. The many bad boundary hedges to arable land bear witness to this, where, a good fence not being absolutely necessary, the neighbouring farmer has to fence against his own stock. Again, as a tenant's interest in his fences ceases when he leaves the farm, he does not as a rule pay such attention to the up-keep of the hedges as is necessary for their welfare. In

addition, tenants are constantly changing their farm hands, and as much of the fencing is done by the latter no consecutive management or treatment is maintained. Farm labourers also are, as a rule, bad hedgers.

Hares and rabbits, where they are numerous, do a considerable amount of harm to quick fences, through barking their stems. Hedges are sometimes so severely damaged that they have to be cut over at the ground and treated as a newly-planted

FIG. 1.—DOUBLE-ROWED THORN HEDGE, WITH GUARD FENCES.

fence for ten or twelve years before they are strong enough to act as a fence again. Proprietors who keep rabbits down save their fences and trees from the ravages of these pests, and prevent endless trouble in assessing damages.

The ribbing-in, that is the cutting back of the lateral growth of the main stem of the plant in early autumn, before the wood is matured, is also detrimental to the healthy growth of the thorn. Trees in hedgerows both directly and indirectly cause gaps in hedges by their shade and exhaustion of the soil. Cattle also gather under them and do considerable harm by baring the roots of the plants.

The white thorn (*Cratægus Oxycantha*) has been proved to be the most useful plant for forming hedges as barriers against stock. Its adaptability to situation and soil are important factors in its favour, and in addition it possesses the all important quality of resistance. The time it takes to rear a thorn hedge depends (*a*) on the quality and preparation of the soil; (*b*) situation; (*c*) the care that is exercised in keeping it clean; (*d*) protection from stock, and (*e*) the method adopted in training. Before laying out hedges there are many things which ought to be considered. If the proposed fence is intended to divide fields, or to serve as a boundary between estates, it is nearly always advisable that it should be straight. Of course, there are certain lines of division which cannot be altered, such as streams serving as boundaries. The writer has several times laid out fences between estates and, by mutual consent of both landlords, a give-and-take line has been adopted.

Reference has been made to injury caused by trees growing in hedgerows, but when trees are planted in such a position, gaps would be less numerous if holly or beech were used underneath the trees instead of thorn. Holly is preferable to beech for hedges next to pastures. Further, hedgerow trees need to be pruned early in life, cutting off the lower branches to nearly one-third of the height of the tree, and foreshortening the lateral growth, to give light to the crops and hedge below.

The soil most suitable for the thorn is a strong loam. The land must be thoroughly drained, and one way to carry off the water from the fence is to run a pipe drain 5 ft. or 6 ft. from the fence on both sides. Sometimes it may be only necessary to attend to drains already in the ground. The conformation of the ground does not always admit of the drains being run parallel to the hedge, but the main point is to carry out the work in the best way so as to keep the hedge dry.

The ground having been drained, trenching operations can be proceeded with, the bed being kept on the level. The raised cam formerly so much employed is quite unnecessary in the majority of cases, as the main object served is at the present day fully met by the thorough system of drainage adopted. In running through hollows where it is occasionally difficult to thoroughly drain, the soil may be raised and a drain-pipe put

through the fence to allow the water to pass from one side to the other. Hedges should never, if it can possibly be avoided, be planted on these raised beds: the sides get broken down by stock, and the bank is a good harbour for rabbits and other vermin, consequently the roots are bared and present an unsightly appearance.

Trenching ought to be done in the autumn previous to planting. In making the trench or bed it should be 3 ft. or 4 ft. wide, and 18 in. or 20 in. deep. If the soil is good to that depth,

FIG. 2.—FENCE CUT BACK TO MAIN STEM TO RESTORE SHAPE.

bring the bottom soil to the top, the top soil, if grass land is being trenched, being laid in the bottom of the bed. The soil should be thrown up roughly in the middle, to expose it as much as possible to the influence of frost, taking care to remove all weeds, especially deep-rooted ones, such as docks, thistles, &c., which if left in will be difficult to eradicate without considerable damage to the thorns. Good, healthy, strong plants, which have been previously twice transplanted, should be used to ensure fibrous roots.

Before planting the stems should be cut off 2 in. or 3 in. above

the soil line—that is, at the depth at which they stood in the nursery row. Long or damaged roots should be neatly cut back. There are some advantages in planting in double rows instead of single, the rows being placed 8 in. or 9 in. apart, and plants in the rows the same distance, and each plant dividing the space between the two opposite.

The thorn thus planted is given more room, and the result is the production of strong lateral growth. If a double-rowed thorn fence should in after years, through neglect, assume a spreading habit, one of the rows may be cut off at the base some years in advance of the other to encourage fresh growth; when strong enough to act as a fence, the other side may be treated in the same way. Great care should be taken not to allow a double-rowed hedge to become foul, for there is greater difficulty in cleaning out the weeds. Having consolidated the soil somewhat in the centre of the bed by treading, the operation of putting in the plants can be begun. It takes two men to put in the plants properly. After the first spadeful of soil is laid on the roots, the plant should be drawn lightly up and down so as to cause the soil to run into the interstices formed by the rootlets. The putting in of the thorn being completed, more soil is laid on the roots and carefully firmed round the stems, finishing by drawing the soil to the plants, leaving them just pointing the surface.

There is another plan which has been adopted with considerable success. The stems are left a little longer than is advocated above, and the soil is made to cover the whole of the plant, which is left in this condition until it shows signs of vitality in the spring. The soil is then taken from the plants to the depth of 3 in. or 4 in., forming a V, with the plant in the middle. The shoots, it is said, come away stronger, and are more numerous than they are when left standing above ground at the time of planting.

The cost of trenching, purchasing plants, and planting, runs from 4d. to 6d. per yard, the cost being principally affected by the nature of the ground. Very often this is not the only expense to be met in putting in a quick fence. Protection rails may have to be erected on one or both sides, and this adds considerably to the initial outlay and up-keep. A three-

barred fence using sawn morticed oak posts and larch rails can be put up for 1s. 1d. per yard. If four-bar, 1s. 6d. per yard.

Protection is absolutely necessary next to pastures, but adjoining arable land this expense is often saved, as no other stock but sheep are, as a rule, fed on the clover math and turnips. Temporary protection from the sheep must be given to the quicks, as they damage the thorn not only by nibbling it, but by leaving their wool on the lateral growth, which is often entirely destroyed. One of the greatest drawbacks to the

FIG. 3.—CUTTING AND LAYERING OF NEGLECTED THORN HEDGE.

forming of thorn hedges is the fencing required for protection and certainly the outlay is heavy when it is found necessary to protect the fence on both sides, and occasionally wire-netting must be used to ensure success if rabbits abound. Assuming, then, that protection from stock and rabbits is necessary, the expenses work out as follows :—Trenching, purchasing, and planting thorn, 5d. per yard ; two guard fences, including cost of erection, 2s. 6d. per yard ; wire-netting, 6d. per yard, making a total expense of 3s. 5d. per yard. Of course it is seldom found necessary to go to this expense. The prices quoted are for first-rate material, which ought to last until the hedge is in a

condition to act as a fence, and then be of further use for repairs.

Except for cutting back the thorn at the time of planting a thorn hedge should not be trimmed or dressed until four or five years after planting. The stems of the plants thicken more than when they are trimmed from the first, and when cut back to, say, 2 ft. from the ground they present a strong appearance. From a great many of the thorns there will have come away two, three, or four shoots, some of which can be dispensed with, and should be cut near the bottom to encourage further growth at that place. An important point in the rearing of hedges is to keep them clean, and it is often necessary to clean twice or three times during the year where weeds are troublesome. If weeds are allowed to choke a hedge it is deprived of light and air (two important factors which determine healthy plant growth), the growth is weakened at the place where it is most required, and immature shoots are formed, which are likely to be affected by frost, and to be predisposed to the attacks of insects.

The illustration (Fig. 1) shows a thorn hedge which was planted in 1901. It is a double-rowed one, and cut for the first time in 1905. Previous to planting this fence there had been one growing on the same bed exposed to ground game. In 1901 there was practically no growth, the small knarled stumps having been nibbled off by rabbits and hares. It was thought advisable to trench afresh, and put in new plants, treatment which has proved successful in consequence of the deep trenching and wiring in of the hedge. The fence now is on an average nearly 5 ft. high and is being cut down to 2 ft. from the ground, and, if a vigorous grower, will be dressed annually. Some manure was applied to this fence about a year after planting, and has had a good effect. It is almost useless attempting to grow hedges on old sites without adding fresh material in the form of, say, road edgings or manure.

After first commencing to trim into shape a hedge which is not growing well, it is an advantage to trim every alternate year instead of yearly ; this has a tendency to strengthen it.

Too much cannot be said in favour of keeping hedges clean. If they are allowed to become very foul, there is always a

danger of the plants getting damaged in attempting to get out the weeds, and there is also a great loss of nutriment, to say nothing of the soil thrown off with the weeds. Weeds also harbour insect pests which may attack the fence. The first cleaning should be done in spring, before any seeding takes place. On land which is very weedy and of a tenacious character, it is often found that, owing to the great amount of cleaning necessary, the soil on the roots of the plants becomes deficient. This is rarely experienced before

FIG. 4.—FULLY-GROWN HEDGE, WITH THE GUARD FENCE REMOVED.

the fence is of sufficient size to do without hand weeding, and at this period the best thing to do is to add fresh soil by scouring the fence, and to keep clean by cutting the weeds down with a sickle twice annually, or oftener if required.

The way in which hedges are trimmed determines both their shape and stability. Dress with an upward stroke, make the hedge wedge-shaped, and never be in haste to raise the hedge to its full height ; these are rules which must be observed to ensure success. Hedges which have been raised too rapidly are often unable to act as a fence owing to the weakness and looseness of growth. Fences which are trimmed regularly for

many years sometimes get, in spite of attention, so unshapely and unnecessarily large, that ribbing-in, or cutting back the lateral growth to the main stem is desirable to bring them back to their former shape, and also cutting back to the base all suppressed or weakly stems to encourage growth. Adjoining pastures this operation is rather risky unless the fence is protected for a time. The hedge in the foreground on the right in Fig. 2 shows the benefit of ribbing-in an unshapely fence which had been annually trimmed.

Restoration of Old Thorn Hedges.—Some of the important qualities which recommend the whitethorn as a hedge plant are, that it is long lived, stands cutting even to an old age, and is therefore easily kept within bounds. The cutting and layering of old thorn hedges is a work that must be carefully done, and they must be protected from stock until the new growth is strong enough to resist cattle, and until those portions of the fence which it is necessary to layer are firmly fixed in their new position. The cutting of old fences which are fairly well supplied with stems all along the line is comparatively easy work, and is successful when it is well done. But when fences with gaps have to be dealt with, greater skill is needed to fill in the gaps with living thorn. A good plan in restoring old hedges is to cut the layers near the ground to encourage growth at the base, and to allow the fence to grow unmolested for six or eight years, then cut and lay again.

The cutting back of old hedges to the level of the ground rarely meets with success where rabbits abound. A fence which had been cut over ten or twelve years ago, had only two living thorns in a distance of 120 yards, the growth of the rest of the stumps having been completely destroyed by rabbits.

A comparatively young fence, which has been neglected for eight or ten years, is shown in Fig. 3. Cutting and layering is a system of restoring hedges which is not approved of by everyone, but the cause of this disapproval is found in the fact that much of this kind of work is so badly done. There is a tendency where there is an abundance of thorns to layer too much, instead of cutting off at the base all the thorns that can possibly be dispensed with, after deciding which of the

thorns are to be retained for layering and acting as living stakes. The next illustration (Fig. 4) shows a hedge which is now strong enough to act as a fence, and from which the guard fence is being removed.

The famous yew hedge in the Raby Castle gardens is shown in Fig. 5. It is of great age and size, and was evidently planted either for the purpose of giving shelter or acting as a screen.

The holly (*Ilex aquifolium*) is a good hedge plant, and would have taken the place of the thorn where the soil was suitable

FIG. 5.—YEW HEDGE, RABY CASTLE.

were it not for its slowness of growth and its liability to be eaten by rabbits. It has good resisting power, and, besides being evergreen, gives shelter all the year. The soil in which this plant grows best is a sandy loam. It should be planted in May or September, using twice transplanted roots; these should have as much soil as possible adhering to them, and be lifted and planted the same day. Should the roots become dry, watering at the time of planting is necessary. A bed should be prepared somewhat similar to the one advocated for the thorn, and if the soil is thin it would be an advantage to give a mulching of manure. Little attention is required for some

years in the way of training to any particular shape, beyond what is necessary to check the lateral and top growth of those plants which have for some reason grown faster than the rest, so as to bring the hedge to a uniform height and thickness. Annual trimming with shears, which ought to be done in summer, need not be commenced until the hedge is nearly high enough to act as a fence. The holly, being a shade-bearing tree, can be trained into almost any shape, as the bottom growth is not much interfered with by the spreading of the top. Needless to say, it makes a good screen for gardens, orchards, &c., and can be grown to a great height with an unbroken face from top to bottom. The cost is about 10d. to 1s. per yard when 12-in. plants are used.

The beech (*Fagus Sylvatica*) makes a splendid hedge for screening and sheltering, and grows best in a gravelly soil. It stands exposure well. Being a shade-bearing tree, it can be grown where thorn or any other light-demanding plant would not be a success, and trained to a good height without losing its closeness of growth. Owing to it being annually trimmed it retains part of its leaves during the winter, thereby enhancing its value as a shelter. The cost of putting in a beech hedge is from 4d. to 6d. per yard. Beech ought not to be cut over at the time of planting.

Evergreen Privet makes a nice garden fence, and is easily reared and tended. It can be put in as cuttings, or the cuttings can be allowed to stand two years in a nursery, and then planted out. In a very short time it will grow into a nice neat fence if cut in closely.

Wire Fence.—This class of fence has been much used of late, owing, no doubt, to its cheapness and durability. Very often, however, wire fences are erected in positions where they are very liable to breakage. The most suitable places are plantations, roadsides, clumps, and pleasure grounds. If a wire fence has to be erected between pastures—a position not suitable for such a fence—a rail should be run along the top in place of wire. This gives the cattle a better chance of seeing the fence when galloping. The cost of erecting a good wire fence, composed of oak or larch posts, standing 6 ft. apart and using galvanised wire, is 10d. to 1s. per yard.

Stone Wall.—This is a good fence and durable. The cost varies considerably, owing to the distance the stone has to be carted and the ease at which it is obtained. To build a wall 4 ft. 6 in. high, with two rows of throughs, tapering from 2 ft. to 10 in., and limed top and throughs, costs about 3s. 6d. to 4s. per yard when carting and material have to be paid for. If the cost of carting and material is not considered, then the price would be about 2s. per yard.

Creosoted Fence.—The cost of erecting a fence of creosoted redwood to turn heavy stock is as follows:—Two top rails, 12 ft. by 4 in. by 1½in., at 10d. each; two bottom rails, 12 ft. by 3½ in. by 1¼ in., at 8d. each; two posts, 6 ft. by 6 in. by 3 in., at 9½d. each; erection at 2½d. per yard; making a total of 1s. 4½d. per yard. It is advisable to obtain, if possible, material free from knots, as the rails are so easily broken at the places where the knots are, besides which many of the knotty rails are either cut out of young trees or from the tops of old ones, and are therefore immature, decay sooner, and are lighter. In erecting a fence of the above material, the rails having the least knots should be nailed on the upper part of the fence.

Seasoning of Fencing Material.—The object in seasoning is to get rid of all the moisture or sap, and to accomplish this various methods may be adopted, but only that of drying in open sheds, *i.e.*, admitting a free current of air and protecting from rain, will be referred to here. In order to check decay, no time must be lost in placing sawn timber under cover. It should be allowed to remain so protected for at least one year, and during this time should be restacked or turned over to facilitate drying. The reason why matured timber or heart wood is more lasting is that the vessels become filled with gum (in hard woods) and resin (in conifers) giving a darker colour to the centre of many trees.

Durability being a most important qualification in fencing material, the primary object must be to obtain matured timber, which is the best to use, either seasoned or unseasoned. Matured timber contains less sap than immatured, consequently there is less shrinkage and less liability to attack by organisms which hasten decay. In the case of timber which is used for

outdoor purposes, the gain would amply repay any expense incurred in erecting necessary plant for proper seasoning.

Preservative Methods.—The common methods are painting, tarring, and charring, but the work should never be done until the timber is seasoned.

The cost of painting rough outside jobs is prohibitive, but work, such as dressed paling, gates, &c., erected in places where people are liable to come in contact with the woodwork, is better painted than tarred. Tarring is the most common method employed in preserving outside rough woodwork. Gas tar should be kept for some time before using as it improves by keeping. Charring is very useful for preserving posts, as it forms an outer coat of charcoal which is immune from the attacks of insects and fungi, and is almost indestructible when placed in the ground. The disadvantages of charring are a loss of wood and cracking; the charred parts should be tarred over, thus plugging up the external cavities of the wood, and preventing the entrance of air and water.

THOMAS BEWICK.

ADVICE TO BEGINNERS IN BEE-KEEPING.

The keeping of bees, both for pleasure and profit, is, happily, much more frequent now than thirty years ago, when the advent of cheap sugar had nearly driven from the country markets the coarse honey gathered by the old straw skep system. This increase of bee-keeping has been brought about by the perfecting of the modern frame-hive, which enables the home of the bee to be laid open to view, and provides means whereby the stores can be taken, fit for immediate use, without injury to the bees or their owner.

For any one desirous of becoming a bee-keeper the first step is to get a book on apiculture and study it. There are many now from which to choose, but the following may be recommended: "Modern Bee-Keeping" (price 6d.), published by

Longmans, Green & Co., Paternoster Row, for the British Bee-Keepers' Association; and the "British Bee-Keeper's Guide Book" (price 1s. 6d.), by Thos. W. Cowan, F.L.S., 10, Buckingham Street, Strand, London. As a personal explanation of the terms used and of the outfit required is a great help, an interview should, if possible, be obtained with an experienced bee-keeper. In "Modern Bee-Keeping" will be found a list of Secretaries of County Bee-Keepers' Associations, any of whom will be able to furnish names of expert bee-keepers willing to render assistance if needed. The appliances required are: Black net veil; smoker, for subduing bees; wax comb foundation (brood and super); bottle-feeder; section boxes; frame-hive, fitted with brood-foundation in ten or twelve standard frames, two division boards, section-rack or lift of shallow frames, a queen excluder and quilts. If the hive is to be worked for extracted honey, a centrifugal honey-extractor will also be needed. Additional useful articles are: Scraper-knife, for cleaning floor-boards, frames, &c.; comb-uncapping knife, for use when extracting; a straw skep, for taking swarms; spare coverings of felt or carpet; a super-clearer, for clearing bees from section racks or supers.

There are many patterns of hives, all made to take the one British Standard frame. A simple one should be chosen possessing accuracy of workmanship and soundness of material, so as to stand exposure to the weather for years. The outside of the hive should be thoroughly painted, to keep it rain and damp proof. It must be placed on its stand in a spot sheltered, if possible, from the cold north and east winds, and with a free flight for the bees in front. Space should be left behind it for easy access, then all manipulations can be carried on from the back; this avoids irritating the home-coming bees.

The swarm should be ordered either from a recognised dealer or from a neighbouring bee-keeper. The only safe way for a beginner to start is with a "head" or first swarm. By this means he will avoid all the pitfalls of disease or lack of condition, which only a practised eye can detect, but which beset the purchaser of second-hand stocks. Given a good season, a swarm should be able to establish itself, and provide some surplus for its owner, in its first year.

When the box or skep containing the swarm arrives, it must be placed in the shade near the hive the bees are to occupy. The screws of the lid of the box should be taken out; or in the case of a skep the cording and wraps should be removed, and in the latter case the skep should be placed on a board, with a fair-sized stone under its edge, to allow of ventilation. The bees will soon quiet down, and cluster, after the shaking up of their journey, and thus will be in a condition for handling easily. In the early evening the hive must be prepared to receive them. The shallow-frame lift or section-super should be taken away leaving only a thin quilt over the frames, which have already been fitted with brood-foundation. Then the front of the hive must be raised from the floor-board about an inch, by means of two wedges. Next, a board, tne width of the hive, is placed in front of, and level with, the alighting-board, sloping down to the ground. This temporary board and the alighting-board are covered with a cloth hanging over the sides to the ground, to prevent bees from crawling underneath. Then the skep or box is taken between the palms of the hands, and carried mouth downwards, until it is just above the sloping board. With a smart jerk, the bees are thrown out in front of the hive, and they will at once begin to take possession of their new home. As they run in, watch should be kept for the queen. It is a satisfaction to see her safely enter her abode. When all are in, the wedges should be taken away and the front of the hive lowered to its proper place. Crushing of any of the bees must be avoided. Any that are in danger may be cleared away with a feather. If the swarm has been a long time on its journey, or if the weather is bad on its arrival, the bees will be greatly benefited by being supplied with half a pint of warm thin syrup, through an opening in the quilt and by means of the bottle-feeder. On the second day after hiving, the quilts should be turned back from the ends of the frames to ascertain if the "foundation" remains properly fixed, and to see if the work is going forward well. If this is the case the quilt may be taken off and the queen-excluder put on in its place. Over this a lift of shallow frames should then be placed and covered warmly with a quilt and carpets. The stock may now be left alone till the end of the honey season. More skill is required for obtain-

ing comb honey in sections in good condition, but the section rack may be used instead of the shallow frames, if desired.

It is important that the beginner should clearly understand the principles that underlie successful bee-keeping. A colony of bees consists of a queen, a large number of worker-bees, and (during summer) a certain proportion of drones. The strength of a healthy stock depends on the vigour and laying power of the queen, who is at her best in her second season, *i.e.*, a queen hatched in June, 1904, is at her best in May, 1905, and should be replaced by a young one in 1906, either by natural swarming or by re-queening. Queens may be purchased, or raised by the methods taught in text-books. The economy of a hive consists, first, on the keeping up of the warmth of the brood nest (by means of the heat evolved from the bodies of the clustering bees) to such a point as will stimulate the queen to lay eggs, and will enable young bees to be reared; secondly, on the feeding of the queen, and nursing of the brood, and cleansing the cells for the queen's use; thirdly, on the obtaining of pollen, water, and nectar for the brood; lastly, on the building of storage combs and collecting nectar for the future supplies of honey.

The first three of these conditions must be fulfilled before the last can be begun; therefore, it is only by means of a large and vigorous surplus population that a stock can gather enough stores for its future use, and provide also for the bee-keeper. It is obvious that the aim of the bee-keeper is to keep his stocks strong, for a weak stock is always unprofitable.

The next consideration is, that the crowded condition of the hive should be secured at the right time, *i.e.*, at the honey-flow. Honey is the concentrated nectar of flowers. Spring and early summer are the times when the land is gay with a wealth of blossom, and the honey-crop is gathered. Late summer and autumn are times of seed and fruit, and only a gleaning of nectar from bramble and wild flowers then remains. There is a period every year, varying in each district according to soil and altitude, when the supply of nectar is most abundant. This time should be ascertained by the bee-keeper, who will then stimulate his stocks beforehand, so that they may have their largest population ready to gather the produce of the various flowers.

Diseases are best guarded against by having dry, weather-tight hives and vigorous queens, and by giving suitable food when feeding is requisite.

The following are the chief maladies to be apprehended :—Dysentery, a disease of adult bees, is caused by undue winter confinement, unsuitable food, and damp hives ; Chilled-brood and Paralysis are caused by sudden frost in late spring, or by untimely manipulation ; Bee-pest or Foul-brood is a terribly infectious disease, endemic in many places in England. A description of this disease is given in Leaflet No. 32 issued by the Board of Agriculture. A copy may be obtained, free of charge, from the offices of the Board, 4, Whitehall Place, S.W., or from any County Bee-Association Secretary.

A word of warning and encouragement on one other point must be given. No one can keep bees without being stung : the sting of a bee is painful but harmless (except in rare instances), and in time, after many stings, the effect is so slight as to be quite disregarded. It is advisable to wear a veil to protect the face and head, but the hands should be left bare. Their best protection is the gentle, careful manipulation of the bees while attending to them. The foregoing is written for those who propose to keep a few stocks of bees : anyone intending to keep a large number of stocks is advised to get a season's instruction in a well-managed apiary before laying out capital n the business.

The *British Bee Journal,* price one penny weekly, and the *Bee Record*, two-pence monthly, are the recognised organs of the Bee Industry in England, and the British Bee-Keepers' Association (Secretary, Mr. E. H. Young, 12, Hanover Square, London) is the headquarters of apiculture in the kingdom.

T. I. WESTON.

COW AND PIG CLUBS IN LINCOLNSHIRE.

The mutual insurance of live stock is a form of co-operation which finds much favour amongst small holders and cottagers in agricultural districts where small holdings and allotments are plentiful, the cow and the pig being the two domestic animals principally concerned. In South Lincolnshire, for instance,

in almost every village and on the outskirts of such market towns as Boston and Spalding, prosperous Pig Clubs exist. Cow Clubs are not so numerous, dairying having declined of late years owing to the great development of potato growing in the district.

Cow Clubs.—At Moulton Chapel, however, between Spalding and Wisbech, a flourishing Society has been in existence for twenty years. This Cow Club may be taken as typical of Societies of the kind; and as it was established in 1884, and has at the present time a larger membership than ever before, its rules and methods have been fully justified by results. The object of the Society is thus set forth :—

"This Society was formed for the purpose of assisting each other in acts of benevolence when overtaken by misfortune." Curiously enough, no reference is made to the form the "acts of benevolence" should take, viz., the recouping of members for loss sustained by the death of cows.

The Society consists of officers and an unlimited number of members, the officers being the President, Vice-President, Secretary, Treasurer, Marker, and a Valuing Committee of three members. The duty of the President is "To keep order during meeting hours, impose fines, and to see justice done between each member and the Society"; the Marker brands each cow entered with the letters "M.C." on the horn, or, if the animal be hornless, on the right foot; and the function of the Valuing Committee is to determine the value in case of illness or death of a cow.

The Society does not retain the services of any particular veterinary surgeon, and the members can employ whom they please. If a member's cow fall ill, the owner will report at once to the Secretary, who forthwith advises the Valuing Committee, all of whom—or at least two of the three—go to see the cow as soon as possible. As soon as the Committee has appraised the cow and seen its condition it becomes the property of the Society, and the Committee can order its slaughter or can otherwise dispose of it. The full value of the cow as a healthy animal is fixed, and of this sum the owner receives 75 per cent., or 15s. in the £, the cheque on the Society's banking account being drawn by the President, Secretary, and Treasurer.

The total fee payable to the Valuing Committee is 5s.; and as in this case the Committee comprises property owners and farmers of a considerable acreage of land, it will be seen that the fee is an extremely modest one, having regard to the fact that cows entered in the Society are distributed over parts of no less than eleven parishes within an area of about twelve square miles, Moulton Chapel being the centre.

Any person wishing to become a member of the Society must be proposed at a quarterly meeting. The entrance fee is 2s. 6d. for the first cow and 1s. for each subsequent cow. The subscription is 6s. per annum for each cow and is payable in four quarterly instalments of 1s. 6d.; the cost of marking is 6d. per cow. Hence, after the first year the cost of insuring three cows would be 18s., while the value of the cows might be any sum between £36 and £65. A member on entering a cow and describing its age and colour, pays the full annual subscription and forthwith becomes entitled to the benefits of the Club. Promptness in payment of subscriptions is insisted upon under penalty of forfeiting all advantages.

The Society above referred to commenced business with thirty-five members and fifty-one cows; there are now 112 members and 225 cows, an average of two cows to each member. The majority of the members have from one to two cows, while some have three and four, and even six cows insured.

About 3 per cent. on the average of the insured cows die during the year, milk fever being the principal cause of death. The Society sustained a loss of £7 during one year only of the series. There was no epidemic amongst the cows (nor has there been since the formation of the Society), but, as it happened, nine cows died during that year, and the disbursements of the Society were about £100, requiring a small draft to be made upon the Reserve Fund.

During the twenty years the funds have accumulated as follows:—

	Funds in hand. £	s.	d.
At the end of 1884	11	12	2
" 1887	54	2	2
" 1890	119	15	10
" 1893	146	12	3
" 1896	140	12	6

	Funds in hand. £ s. d.
At the end of 1899	179 10 5
„ 1902	253 17 11
„ 1904	292 3 9

Of the £292 3s. 9d. standing to the credit of the Society on December 31st, 1904, £200 is lent on the security of real estate, and the balance is on current account at the Society's bankers. The members meet at head-quarters for their annual supper, half the cost of which is discharged out of the Club's funds. The Secretary, a substantial farmer and dealer, receives an extremely moderate salary for his work.

The Society made one mistake which was soon remedied. Any sort of cow was at first admitted, with the result that the Society was imposed upon by a few persons who bought and entered old cows of little value and claimed average value at death. This practice was effectually stopped by the adoption of a new rule to the effect that no cow would be accepted for insurance which had had more than two calves. Again, if the Marker has cause to suspect that any cow required to be marked by him is unsound or diseased, he is not allowed to mark such cow without the concurrence of the Valuing Committee; and as the Marker is a practical man and himself a cow-keeper, the Society is sufficiently protected. If a member lose a cow or cows from any contagious disease, he is not allowed to enter another until the cow-shed and adjoining buildings have been thoroughly disinfected.

The value of the Society to small cow-keepers is shewn by an examination of the counterfoils of the cheque book, which indicate that one unlucky occupier of less than eight acres of land has received payment for four cows; another small farmer, "overtaken by misfortune," for three cows; while a third had on one occasion two cows killed by lightning.

The success of the Society is largely due to the fact that the members are thrifty, reliable men, and the responsible officials are substantial farmers who attend to the business of the Society, and whose interest in the Club has increased as they witness year by year the advantage which it gives to their neighbours.

Pig Clubs.—The constitution, membership, and working of an

average Pig Club is on similar lines. The management is usually in the hands of cottagers, with the host of the inn as Treasurer, the Society having a current account at the local bank and a small capital sum invested in the Savings Bank. Few, if any, of these Clubs are registered under the Friendly Societies' Acts.

Similar rules are adopted by each Society. The entrance fee is usually 1s. for each pig and 1d. per week subscription for each pig. An extra charge is made for insuring breeding sows, while sucking pigs are not admissible. Some Societies limit the number to four pigs for each member, a rule which meets the requirements of nearly all cottagers and allotment holders.

The pig is marked usually on the right ear, and the Marker is paid a fee of 3d. In case of illness the owner promptly reports to the Secretary or to a member of the Committee and the Valuing Committee inspect the pig as many times as is considered necessary, receiving therefor 6d. each. If swine fever is suspected the matter is reported to the Police Officer.

The owner has to choose whether he will "surrender" the sick pig to the Society or not. If he decide to do so, the Committee dispose of the pig as they think fit. The proportion of value allowed to the members varies; in some Clubs it is 15s. in the £, in others 17s. 6d., and, occasionally, the full value is allowed.

Pig Clubs do not, as a rule, accumulate a large Reserve Fund. From £20 to £30 is considered a sufficient Reserve Fund for a Club with forty or fifty members, and, occasionally, after this amount is secured, further profits are divided up annually after the manner of Dividing Clubs. The income of these Clubs is frequently augmented by subscriptions from honorary members.

One of the most successful Clubs in South Lincolnshire is that of St. Nicholas and Holy Trinity, near Boston. It has been established ten years, has two branches, and a total membership of 135, with 217 pigs insured. Fifteen claims have been paid during the past year, amounting to £39 2s. 1d., against £39 5s. 4d. in 1903. The claims paid since the formation of the Club amount to the sum of £207 12s. 4d., and the balance now standing to the Club's credit is £55 18s. 5d., an increase for the year of £14 5s. 6d. The sum of £2 is paid to the Secretary

of each Branch as salary, and a contribution from the funds of the Club is made towards the annual supper. This contribution amounted in 1904 to £11.

The provision of allotments for cottagers and labourers has caused a rapid increase in the number and membership of Pig Clubs; and it is now a very unusual sight for a cottager to be seen taking round a "brief," drawn up by the village schoolmaster, asking his neighbours to help him "towards defraying the serious loss sustained through the death of a valuable"—cow or pig.

J. H. DIGGLE.

ARTIFICIAL INCUBATION.

A series of observations on the artificial hatching of chickens made during the twelve months ending March 31st, 1904, at the Reading College Poultry Farm, Theale, showed that out of 3,647 fertile eggs placed in 13 incubators (62 hatchings) there were brought out 2,572 chickens and ducklings, an average of slightly over 70 per cent. Of these the highest percentage (92·10 per cent.) was obtained in April, 1903, and the lowest (50 per cent.) in March, 1904. The tank incubators (38 hatchings) gave an average during the year of 70·89 per cent., and the hot-air machines (24 hatchings) of 68·95 per cent. A full report of these experiments, together with description of the incubator house in which the operations were conducted, and the temperatures outside and inside the hatching chamber, was given in the *Journal of the Board of Agriculture*, June, 1904 (pages 135 to 143). A further series of observations, made in the twelve months ending March 31st, 1905, are now available.

In the previous article it was mentioned that an incubator house had been specially built at Theale, and that careful records were being kept of the temperatures both outside and within the house to see how far variations of temperature could be avoided in a building of that description. Similar records for the later year are given in the table on the following page.

The records in Table I. are given at intervals of fourteen days during the entire period, as the complete figures would occupy too great an amount of space, but they may be accepted as fairly

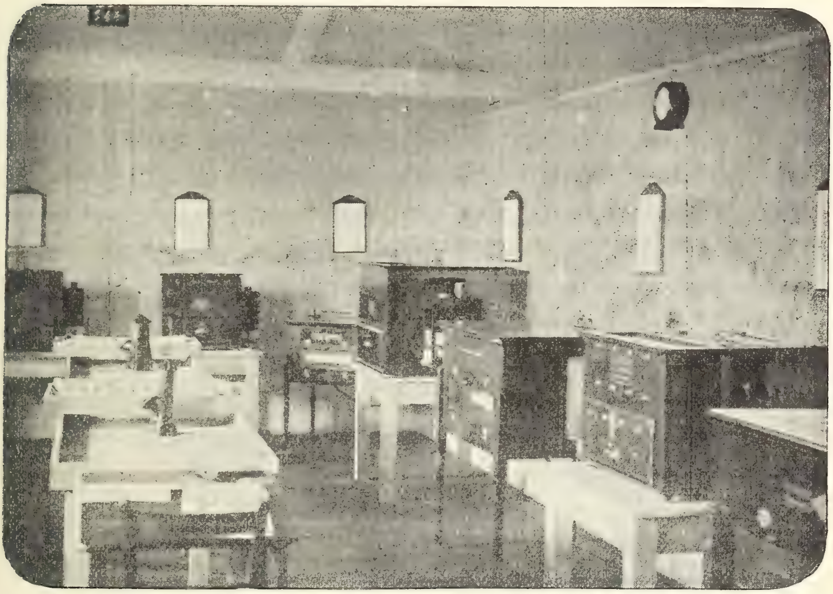
TABLE I.—COMPARATIVE TEMPERATURE IN THE OPEN AIR AND IN THE INCUBATOR ROOM.

Date.	Outside.		Incubator Room.		
	Maximum Temp.	Minimum Temp.	Morning Temp.	Morning Humidity of Atmosphere.*	Afternoon Temp.
1904.	F.	F.	F.		F.
April 4 ...	59	45	60	76	61
,, 18 ...	63	34	68	73	68
May 2 ...	70	41	62	94	59
,, 16 ...	74	37	66	94	64
,, 30 ...	69	51	65	88	70
June 13 ...	76	52	68	78	70
,, 27 ...	85	54	66	83	67
Aug. 1 ...	79	54	70	65	74
,, 15 ...	73	52	68	73	70
,, 29 ...	70	45	73	79	79
Sept. 12 ...	63	37	62	77	62
,, 26 ...	60	35	59	82	63
Oct. 10 ...	57	33	65	78	63
,, 24 ...	54	47	60	71	66
Nov. 7 ...	56	47	60	71	57
,, 21 ...	47	28	52	74	53
Dec. 5 ...	53	40	57	81	58
,, 19 ...	54	26	52	74	54
1905.					
Jan. 2 ...	32	18	48	93	45
,, 16 ...	35	25	40	63	42
,, 30 ...	45	28	52	86	53
Feb. 13 ...	45	30	57	70	64
,, 27 ...	59	32	50	68	54
Mar. 13 ...	59	35	54	80	58
,, 27 ...	59	41	59	66	66

* A wet and dry bulb hygrometer is used, by which the temperature of the room is recorded, with the saturation point; and the humidity is calculated by means of Glaisher's hygrometrical tables.

representative of the entire year. Comparisons with 1903-4 show that in the months of April, May, June, 1904, February and March, 1905, the temperature was higher than in the corresponding months of the previous year, and that in August, 1904, and January, 1905, the temperature was lower than in the corresponding months of the previous period. The lowest temperature recorded in 1903-4 was in January, 1904 (23° F.), whereas in January, 1905, 18° F., or 14° of frost, was reached. In so far as the whole year under review is concerned, the temperature was higher than during the preceding twelve months. In this connection it is of special importance to note

the remarkable evenness of the incubator room, in spite of variations in the outer atmosphere. The lowest record is on January 16th, 1905, Morning 40° F., Afternoon 42° F., when the outer registers were, maximum 35° F. and 25° F., respectively. On the 2nd of that month, when the thermometer outside fell to 18° F., the room was not below 45° F. On the other hand, on June 27th, 1904, when the maximum outside temperature reached 85° F., the incubator room did not rise above 67° F. The highest record was on August 29th, 1904, namely, 79° F.



INTERIOR OF INCUBATOR HOUSE.

Such results could only be obtained in an above-ground building, if it is sheltered from the sun's rays and well ventilated. The incubator house at Theale is effectively shaded by a large walnut tree. The humidity records show that whilst at no part of the year was saturation point reached in the incubator room, only on three occasions out of the selected days did the atmospheric moisture exceed 90 per cent., and that only on four of these days did it fall below 70 per cent. The variations of temperature and humidity in the incubator room are shown in Diagram I., from which it is apparent that the dampness or

humidity of the air frequently varies in inverse ratio with the temperature.

During the year under review the same leading makes of machines were employed as in the previous twelve months. For a portion of the period three other incubators were tested, but only for part of the time, and it would be unfair to include them. Those recorded below are well known, namely, A, Hearson's Champion ; B, Tamlin's Nonpareil ; and C, the Cyphers. A and B are tank machines and C a hot-air, non-moisture

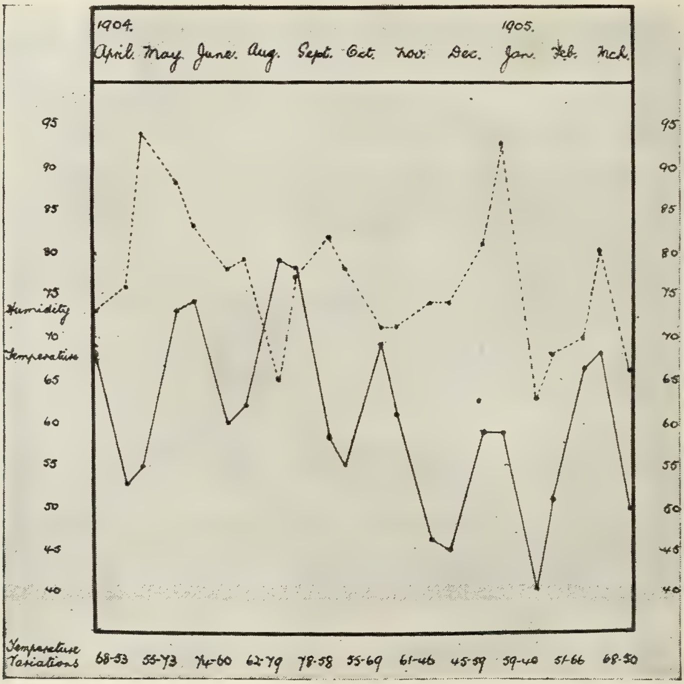


DIAGRAM I.
VARIATIONS OF TEMPERATURE AND HUMIDITY IN THE INCUBATOR HOUSE.

incubator. From Table I. it will be seen that all were equally supplied atmospherically with a large amount of moisture apart from that artificially provided in A and B. Table II. gives the record of each incubator during the entire twelve months, showing (1) the number of eggs placed in the machine, (2) number of fertile eggs as revealed by testing on the seventh day, (3) number of chickens hatched, and (4) percentage of fertile eggs hatched. The fertile eggs alone are calculated in working out the

percentages, as only these have the possibility of producing chickens or ducklings. It may be explained that the incubators are worked by students, who are required to keep careful records of the variations and results, during the various courses as part of their instruction, under the direction of the practical instructors.

TABLE II.—HATCHING RECORDS.

Date of Hatching.	Class of Machine.	No. of Eggs.	No. of Fertile Eggs 7th day.	No. of Chickens Hatched.	Fertile Eggs Hatched.
1904.					Percentage.
April 5 ...	B	169	112	93	83·03
,, 12 ...	A	97	87	62	71·26
,, 12 ...	C	126	109	74	67·89
,, 15 ...	C	120	104	64	61·54
,, 18 ...	B	103	86	66	76·74
,, 18 ...	B	100	92	52	56·52
,, 21 ...	C	224	192	138	71·87
,, 25 ...	C	224	182	137	75·27
,, 29 ...	C	54	40	31	77·5
May 5 ...	A	94	82	58	70·73
,, 5 ...	C	111	89	68	76·4
,, 17 ...	C	220	202	139	68·81
,, 19 ...	A	91	84	71	84·52
,, 19 ...	C	212	180	107	59·44
,, 26 ...	B	40	37	27	72·97
,, 26 ...	C	54	45	32	71·11
,, 30 ...	C	69	62	46	74·19
June 2 ...	A	30	22	18	81·82
,, 3 ...	C	47	40	32	80·0
,, 6 ...	B	40	20	13	65·0
,, 10 ...	B	39	31	22	70·97
,, 11 ...	A	80	71	59	83·1
,, 18 ...	B	42	36	26	72·22
Aug. 1 ...	B	54	51	41	80·39
,, 1 ...	B	36	24	18	75·0
,, 2 ...	C	23	20	16	80·0
,, 4 ...	A	97	88	79	89·77
,, 29 ...	C	35	28	22	78·57
,, 31 ...	A	64	56	42	75·0
Sept. 2 ...	B	79	62	38	61·29
,, 19 ...	C	100	96	69	71·87
,, 20 ...	C	54	48	40	83·33
,, 26 ...	C	53	45	38	84·44
,, 27 ...	A	90	88	79	89·77
Oct. 1 ...	C	82	62	60	96·77
,, 11 ...	B	82	63	61	96·82
,, 15 ...	C	83	69	56	81·16
,, 15 ...	C	54	46	33	71·74
,, 20 ...	C	48	41	31	75·61
,, 24 ...	A	82	58	56	96·55
Nov. 6 ...	B	52	38	28	73·68
,, 13 ...	C	56	51	43	84·31
,, 22 ...	A	30	23	19	82·61
,, 22 ...	C	31	24	21	87·5
Dec. 13 ...	C	57	43	37	86·05
,, 19 ...	A	60	34	26	76·47

Date of Hatching.	Class of Machine.	No. of Eggs.	No. of Fertile Eggs 7th day.	No. of Chickens Hatched.	Fertile Eggs Hatched.
1905.					Percentage.
Jan. 6 ...	B	70	52	42	80·77
,, 8 ...	A	41	35	33	94·28
,, 8 ...	B	72	36	24	66·66
,, 16 ...	A	103	26	21	80·77
,, 30 ...	C	89	72	65	90·28
,, 30 ...	B	98	60	53	88·33
,, 31 ...	A	50	41	26	63·41
Feb. 9 ...	C	225	178	121	67·97
,, 15 ...	A	95	80	62	77·5
,, 15 ...	B	99	72	56	77·77
,, 16 ...	A	55	42	35	83·33
,, 23 ...	B	55	52	39	75·0
,, 27 ...	C	122	86	66	76·74
,, 27 ...	B	93	67	51	76·12
March 2 ...	A	52	49	37	75·51
,, 10 ...	A	95	71	57	80·28
,, 10 ...	C	108	64	39	60·95
,, 11 ...	B	100	92	71	77·17
,, 20 ...	B	55	44	31	70·45
,, 22 ..	C	200	173	141	81·5
,, 23 ...	C	112	79	53	67·08
,, 25 ...	B	104	80	63	78·75

An examination of Table II. again supports what was a very striking fact in the previous report, namely, that the highest averages were obtained by machines which, after taking out the infertiles on the seventh day, were only partially filled. The five hatches, shown in table below, which produced over 90 per cent. of chickens from fertile eggs were all working much below their nominal capacity. This is very suggestive, confirming what was stated before, namely, that "overcrowding is undesirable in the embryonical stage of a chicken's development." The temptation to work machines to their full extent is great, but the result may not be profitable.

Date of Hatching.	Class of Machine.	Capacity.	No. of Fertile Eggs.	No. of Chickens Hatched.	Percentage of Capacity.
1904.					
Oct. 1 ...	C	120	62	60	51·66
,, 11 ...	B	100	63	61	63·0
,, 24 ...	A	100	58	56	58·0
1905.					
Jan. 8 ...	A	50	35	33	70·0
,, 30 ...	C	120	72	65	60·0

It is seen that these observations apply to all the different types of incubators.

During the twelve months the number of hatchings was 68, or six more than in the previous year. Into the machines 5,881 eggs were placed; of these 4,714 proved fertile, or 80·15 per cent.; the number of chickens and ducklings hatched was 3,574, or 75·82 per cent., an advance of nearly 6 per cent. over the average of 1903-4, which excellent result may be attributed in part to the favourable season, and is especially satisfactory when it is remembered that the machines are largely managed by students, some of whom have had no previous experience in artificial incubation. The monthly average of fertility of eggs is given in Table III.

TABLE III.—FERTILITY OF EGGS.

Month.	No. of Hatches.	No. of Eggs.	No. Fertile.	Percentage of Fertility.
1904.				
April	9	1,217	1,004	82·49
May	8	819	781	87·65
June	6	278	220	79·13
August	6	309	267	86·40
September ...	5	376	339	90·16
October	6	431	339	78·65
November ...	4	169	136	80·47
December ...	2	117	77	64·95
1905.				
January	7	523	322	61·56
February ...	7	678	603	88·93
March	8	826	652	78·93

The highest and lowest percentages of fertile eggs hatched by each class of machine during the twelve months were as follows:—

Class.	Highest.	Lowest.
A	96·55	63·41
B	96·82	56·52
C	96·77	59·44

The remarkable feature of the hatchings as indicated in Diagram II. is that the highest percentages obtained were practically from October, 1904, to January, 1905, the record being attained in the former month. This is undoubtedly to some extent due to the fact that the machines were working at that season much below their egg capacity, as will be seen in Table II., and to the smaller number of incubators at work in

November and December. In Table III. it will be observed that the percentage of fertility was very low in December, 1904, and January, 1905, but high in November, 1904. In fact, it is generally evident that with increased percentage of fertility the ratio of hatching decreases, due to the egg chambers having a larger number of eggs therein.

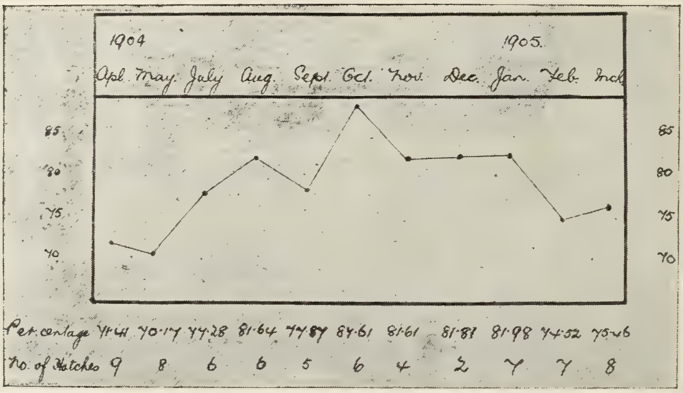


DIAGRAM II.—MONTHLY PERCENTAGES OF FERTILE EGGS HATCHED.

The variations in the percentage of eggs hatched by the different classes of machines as given below are interesting, and may in some cases be capable of explanation, but they are stated as they occur.

TABLE IV.—HIGHEST AND LOWEST PERCENTAGES FOR EACH MONTH.

Month.	Class of Machine (highest).	Highest Hatching Percentages.	Class of Machine (lowest).	Lowest Hatching Percentages.
1904.				
April	B	83·03	B	56·52
May	A	84·52	C	59·44
June	A	83·10	B	65·0
August	A	89·77	A & B	75·0
September ...	A	89·77	B	61·29
October	B	96·82	C	71·74
November ..	C	87·5	B	73·68
December ...	C	86·05	A	75·47
1905.				
January	A	94·28	A	63·41
February ...	A	83·33	C	67·97
March	C	81·5	C	60·95

Diagram III., shows the percentages of hatchings for tank (A and B) and hot-air (C) machines respectively. It will be seen that in April, May, August, September, October, 1904, February and March, 1905, the tank machines gave the higher

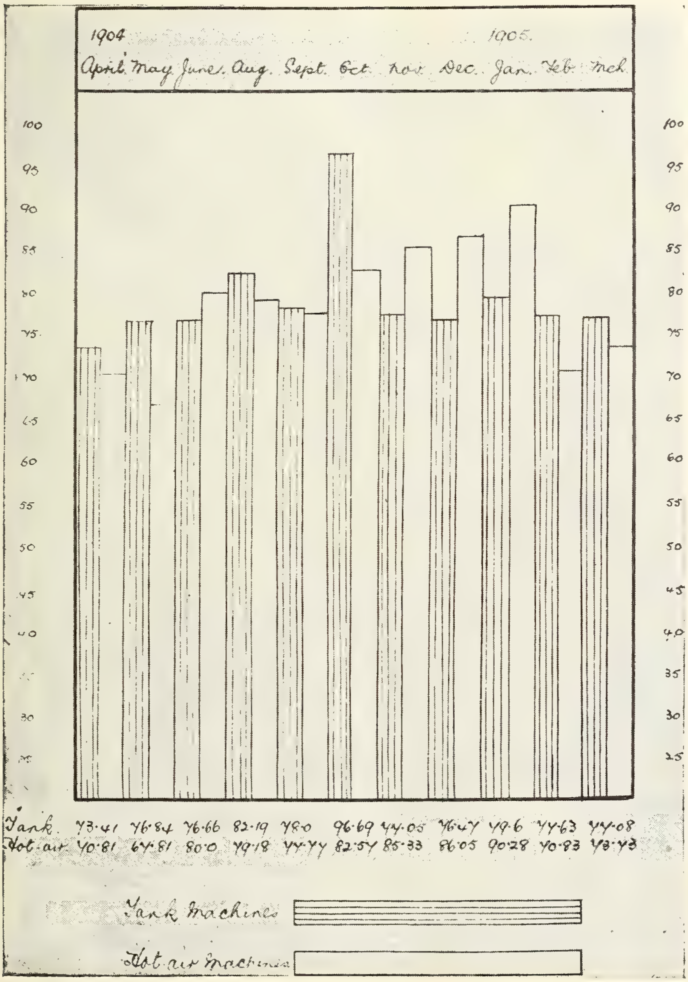


DIAGRAM III.
MONTHLY PERCENTAGES OF HATCHINGS IN TANK AND HOT-AIR MACHINES.

percentages; and that in June, November, December, 1904, and January, 1905, the hot-air machines were in advance of the others. Taking the entire period of twelve months the percentages for the tank incubators worked out to 78·2 per cent. of fertile eggs

(39 hatches), compared with 70·89 per cent. (38 hatches) in 1903–4; while the hot-air incubators gave 73·64 per cent. (29 hatches) against 68·95 per cent. (24 hatches) in the preceding year.

It will thus be seen that the records for both types of incubators are higher in 1904–5 than in 1903–4, but that the tank machines have improved upon the position they then held.

During the year the A type of machine hatched out 81·[illegible] per cent. of fertile eggs (840 out of 1,037); B type hatched out 75·90 per cent. (915 out of 1,207); and C type 73·64 per cent. (1,819 out of 2,470) fertile eggs.

Hens have chiefly been employed for the hatching of ducklings, and the extent of observations with incubators was too limited to make any special records.

The results of the year's operations have been eminently satisfactory, and to secure with so large a number an average of 75·82 per cent. is indicative of the success attending the use of artificial methods of hatching under suitable conditions and with well-made, reliable machines.

EDWARD BROWN.

Agricultural Credit Banks.

In agriculture to an even greater degree than in commerce the function of credit seems peculiarly applicable. In trade the purchase and sale of goods is usually effected within comparatively short limits, whereas the growth of crops and the breeding of stock alike require the advance of money and labour for long periods before any return can be expected. Pending the sale of his produce and the realisation of his profits, the farmer may reasonably require assistance for the purchase of fresh stock, manures, feeding stuffs, and implements, or to enable him to take full advantage of his opportunities—to buy in a cheap market or to hold his produce for a rise. The landowner, also, may need money for improvements, for drainage, for making farm roads, or farm-buildings, etc.—expenditure from which he can only receive a very gradual return in the form of

rent. How to make the capital thus required accessible to agriculturists at a low rate of interest is a problem which has attracted great attention on the Continent during the last half-century, and in many countries it seems to have been satisfactorily solved.

In Great Britain the needs of owners of land desirous of carrying out agricultural improvements with the aid of borrowed money are met to some extent by the provisions of the Improvement of Land Act, 1899, and earlier Acts of the same character, which authorise the creation of rent-charges over a series of years. Here, however, the security offered, viz., the land, enables the advances to be obtained with much greater facility than where the security partakes of the nature of personal credit. In the latter direction little progress has, as yet, been made in Great Britain, the number of loan banks on a mutual or co-operative basis being insignificant, but in Ireland there has been a considerable development in the past five years. This is largely due to the difference in the conditions prevailing in the two countries. Banks of this character are, no doubt, more suitable to the needs of the small holder than to those of the average tenant farmer, as may be gathered from the fact that it is among the peasant proprietors of the Continent that they have reached their greatest development. The practicability, however, of this form of self-help is undeniable, and in districts where small cultivators are sufficiently numerous there seems no reason why one or other of the methods which have proved successful elsewhere could not be adapted to meet local conditions in this country.

The *Labour Gazette* for April last contains a note on this subject, in which it is stated that with few exceptions the societies at present in existence (in Ireland, chiefly,) are organised upon what is known as the "Raiffeisen" principle, the main features of which are that no shares are issued, the capital being raised by entrance fees, subscriptions and deposits, and loans bearing a fixed rate of interest; that the liability of the members is unlimited, every member being jointly and severally responsible for any losses that may be incurred by the society; that the loans advanced by the societies are for reproductive purposes only, the borrower being required to

satisfy the managing committee that the object for which the loan is required is one that affords a reasonable security for his being able to repay the loan at the date fixed; and that the operations of a society are confined to a small area in order that the personal character and needs of applicants for loans may be known to the members and committee.

All the societies existing in the United Kingdom, with the exception of fifteen (thirteen of which are town societies) are registered under the Friendly Societies Acts as "Specially Authorised Societies." The fifteen societies are registered as Industrial and Provident Societies, with share capital and limited liability. In a number of cases in Ireland, where sufficient local capital has not been available at the commencement of the society, loans ranging in amount from £50 to £100 have been advanced at a low rate of interest by the Congested Districts Board, or by the Department of Agriculture.

In the following table the progress of these societies during each of the six years for which statistics are available is shown. It will be seen that in 1903, as compared with 1898, the number of societies had multiplied five times and the membership four times; the capital had more than doubled; the amounts of loans advanced and repaid had each multiplied about $2\frac{1}{4}$ times; while the working expenses had doubled and the profits trebled:—

Year.	Number of Societies Making Returns.	Total Number of Members.	Total Capital (Share, Loan and Reserve).	Amount of Loans. Advanced during Year (including Renewals).	Amount of Loans. Repaid during year (including Interest).	Working Expenses, including Interest on Capital.	Profit after allowing for Interest on Capital.
			£	£	£	£	£
1898	31	2,659	42,245	14,955	11,734	1,396	212
1899	48	3,472	47,511	17,773	12,712	1,658	309
1900	64	5,015	53,922	17,975	14,461	1,901	493
1901	81	6,014	64,746	20,058	19,777	2,012	568
1902	114	7,921	77,607	31,107	23,279	2,671	813
1903	154	10,509	85,128	33,753	27,194	2,938	652

Except in the case of the fifteen societies referred to above, no dividends are paid by the societies, the profits, after working expenses and interest on loans and deposits have been paid

being carried to the reserve funds and used as working capital.

It is claimed for these societies that, by advancing loans for the purchase of a cow, or a few pigs, and for similar purposes, they have enabled many labourers to realise considerable additions to their income, and that as yet no bad debts have been incurred.

Considerable progress is shown in 1903 as compared with 1902, the number of societies in 1903 being 154 as compared with 114, and the membership 10,509 compared with 7,921. The total capital was £85,128, or an increase of 9·7 per cent.; the amount of loans advanced £33,753, an increase of 8·5 per cent.; and the profit after allowing for all expenses £652, a decrease of about 20 per cent.

The following table shows the membership, capital, business and profits of Co-operative Credit Associations during the years 1902 and 1903, distinguishing England and Wales, Scotland and Ireland, and town from agricultural districts:—

—	No. of Societies Making Returns.	No. of Members.	Capital. Share and Loan.	Capital. Reserve.	Amount granted in Loans during the Year.	Amount of Loans repaid during year, including Interest.	Working Expenses, including Interest on Capital.	Profit after allowing for Interest on Capital.
England & Wales:—			£	£	£	£	£	£
Town Districts	11	1,931	9,182	229	6,648	4,676	417	123
Agricultural Districts	7	199	962	148	679	723	41	21
Total England & Wales, 1903.	18	2,130	10,144	377	7,327	5,399	458	144
Ditto, 1902 ...	17	1,549	10,567	282	4,450	4,286	581	262
Scotland:— Town Districts, 1903 ...	2	777	47,156	6,176	5,340	6,047	1,854	209
Ditto, 1902 ...	2	768	46,852	5,963	10,822	8,283	1,656	288
Ireland:— Agricultural Districts, 1903	134	7,602	20,249	1,026	21,086	15,748	626	299
Ditto, 1902 ...	95	5,604	13,350	593	15,835	10,710	434	263

An account was given in this *Journal* in June, 1902, of the

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steps taken by the Co-operative Banks Association, since incorporated in the Agricultural Organisation Society, for the establishment of village banks in the rural districts in England. A village bank, which joins the Agricultural Organisation Society, receives on formation a complete set of books free, together with simple instructions for keeping the accounts, and specimen model rules. The Central Association also gives expert advice from time to time as required.

In Germany, among the various systems of real credit, *i.e.*, loans on real estate, the best known takes the form of a voluntary association of land-owners ; these associations, known as *Landschaften*, have been in existence for over a century, and make advances to their members by the issue of negotiable debentures, bearing interest at 3 or 4 per cent. guaranteed by the society. They usually operate in small areas, and are controlled by legislation and by the public authorities. Their great advantage, in addition to a low rate of interest, perhaps rests on the fact that they ensure the borrower who has sunk the loan in improvements against any sudden demand for the repayment of the capital. Although the operations of these societies have been attended with great success, it is on the side of personal credit that the greatest development has taken place in Germany. The principles on which the agrarian banks known as the Raiffeisen Credit Associations, which date from about the middle of the last century, are based, have been mentioned above, and it is claimed that they have effectually delivered the German agriculturists out of the hands of the usurers. Their number has increased very greatly, especially during the past ten years, and similar institutions exist in Austria, Switzerland, Belgium, France, and Italy. In Belgium the number of these societies has increased from thirty-three in 1895 to 313 in 1902 with over 15,000 members.

Co-operative Banks have also taken a prominent place in Italy. The Rural Loan Societies, which were inconsiderable in number in 1892, have since increased rapidly, and at the end of 1903 amounted to 1,246. Raiffeisen Banks also exist to the number of 730, but no marked progress in their number appears to have recently taken place. In Spain also there has in recent years been a great development of co operative credit.

In France the demands for real credit are met by the Crédit Foncier, an institution under Government control, which enables house and land-owners to raise money on mortgage at a low rate of interest, with facility for repayment by an annuity including redemption of the capital. This institution, which dates from the year 1852, has been very successful, and its methods have been largely copied in other countries. On the side of personal credit, there has been considerable activity, though not to anything like the same extent as in Germany. Since 1899 the Government have placed sums of money to be used as capital at the disposal of the banks, and there were in all in 1903 some 1,038 institutions of one form and another for the promotion of agricultural credit.

A more detailed account of the systems in operation in France will appear in the next issue of this *Journal*, and will be followed by particulars relating to other countries where the methods adopted have features worthy of note.

Lime Nitrogen.

The discovery of a means of fixing the free nitrogen of the air in a way which makes it available as a manure was referred to in an earlier number of this *Journal* (March, 1904, p. 506). The method employed by the inventor, Dr. Frank, is to obtain, in the first place, nitrogen from the atmosphere by passing air through vertical retorts or cylinders containing copper shavings, and heated to a temperature of about 400° C. In passing through these cylinders the oxygen of the air is taken up by the copper, and the nitrogen is conveyed in pipes to a retort, which is heated by an electric furnace to 700-900° C., and filled with calcium carbide. The nitrogen is absorbed by the carbide, and forms calcium cyanamide. The crude product, known in Germany as lime nitrogen (Kalkstickstoff), takes the form of a black powder, similar to basic slag, and contains about 20 per cent. of nitrogen. It is at present only being manufactured on a small scale, but if it can be produced cheaply enough it is likely to be a competitor to nitrate of soda and sulphate of ammonia. One important factor in its

manufacture seems to be the possession of a cheap means of producing electricity, as calcium carbide, the substance with which the nitrogen is combined, is made by heating chalk and some form of carbon in an electric furnace. Experiments to test the manurial properties of this substance were carried out in 1901–3 by Professors Gerlach and Wagner at the Experiment Stations at Darmstadt, Posen, and elsewhere, and Dr. Gerlach put the comparative effect of lime nitrogen at 74 per cent. of that of nitrates. On some land and under certain conditions it was found to be injurious, for instance when applied as a top dressing to quite young plants, and again on land inclined to sourness. Dr. Frank, of the *Cyanid Gesellschaft*, gives the following directions in regard to the use of this material:—(1) the amount applied should be from 1 to $2\frac{1}{4}$ cwt. per acre, according to the condition of the soil; (2) it should be mixed with about twice the quantity of dry earth; and (3) it should be broadcasted a week or a fortnight before seeding, and the soil immediately lightly ploughed so as to bury the manure to a depth of 3–5 inches.

During the past year a number of experiments have been carried out with this material, and the results show that lime nitrogen is likely to prove a satisfactory nitrogenous manure.

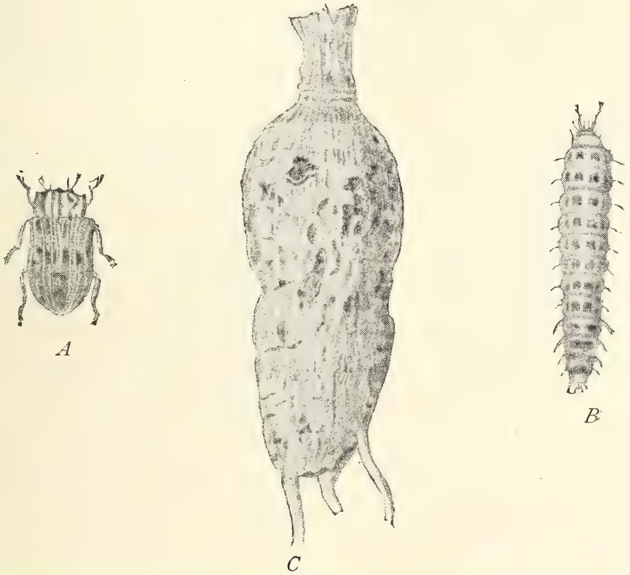
The Turnip Mud-Beetle.

The Turnip Mud-Beetle (*Helophorus rugosus*) belongs to a family of beetles the life histories and food habits of many of which are imperfectly known. The best known members of the family are aquatic, both as adults and as grubs, and the grubs may be vegetable feeders or they may be carnivorous. The species of the genus *Helophorus* are non-swimmers, although they can be found on water, near water, and in mud. They are capable of flight, and species have been found away from water on herbage.

As to the distribution of *Helophorus rugosus*, Fowler describes it as "rather local, but widely distributed through England and Wales inland and near the coast, not so common in the North; Scotland, scarce: Lowlands, Tweed, Forth,

Solway, and Dee districts." It is interesting that, as far as is known, all the complaints made as to the destructive work of this beetle on turnips have come from Aberdeenshire.

Method of Attack.—(1) The leaves may be eaten. (2) The leafstalks may be holed and tunnelled. (3) The swollen root-tubers may be irregularly gnawed and tunnelled on the outer surface, and this especially in the upper part. The harm is



HELOPHORUS RUGOSUS.—*A*. Beetle, magnified (after Rye). *B*. Larva, magnified (after Ormerod) *C*. Turnip, showing gnawings of grub.

done by both beetle and grub. A favourite place for the pests is at the crown of the tuber sheltered amongst the leaf bases, the young leaves being destroyed as they come forward. Attacked leaves curl up, and attention may be drawn to the presence of the pest by the curled leaves standing straight up from the tuber and close together. The holes made in the tuber afford entry to rain and fungous enemies, and the plants may die off.

Description of Beetle and Grub.—The adult insect measures about one quarter of an inch ; it is oval, oblong, and somewhat broad. The colour is dark reddish, but the redness may be obscured by a covering of mud. The thorax is irregularly ridged and knotted, with its front angles prominent. The wing-covers show here and there dark markings ; between

the longitudinal ridges of the wing-covers are rows of punctures. The legs are pale red, and the antennæ of the beetle are somewhat thickened towards the top.

The appearance of the magnified grub is well shown in the illustration. The dark coloured head has brownish jaws. The three segments behind the head each carry a pair of legs; on the upper surface of these thoracic segments is a dark transverse curved line, whilst down the back of the remaining segments there are two rows of large square spots, with rows of smaller spots below down each side. The body ends in two processes.

Some grubs sent to the Board of Agriculture early in October, 1904, measured over one quarter of an inch, and were not full-fed.

Remedial Measures.—The complete life history of this beetle is not yet known, but in the observations made up to the present it has been found that turnips grown in a field adjoining a field infected in the previous year are those most likely to be attacked. In the rotation, then, as far as practicable, turnips should be sown as far as possible from the infected field. In fighting the pest the most successful measure has been the application to the crop of stimulating dressings; 1 cwt. of nitrate of soda per acre proved satisfactory on that portion of the field least infected.

R. STEWART MACDOUGALL.

Use of Bisulphide of Carbon against Wireworms.

The use of bisulphide of carbon as a remedy for wireworms in flower-beds and borders is suggested in the Board's leaflet (No. 10), and it may be noted that this substance has been used very successfully on a large scale against the vine phylloxera, and there are excellent records in its favour against the maggots which attack cabbage. The character of the soil determines the rate at which the fumes diffuse through the soil. On heavy clay soils, especially if these be soaking wet, diffusion is very slow; on clay soil, moist but not too wet, diffusion takes place more quickly; and diffusion is most rapid

in sandy, porous soils, and if these be too dry at the time of treatment the insects within range are not long enough exposed to the vapour to be killed.

In using bisulphide of carbon as a remedy against wireworms the following points should be noted :—

(1) The soil must not be too wet or too dry at the time of use, and after applying it there should be no cultural operations for a week at the very least, longer would be better. (2) The treatment should be in time, *i.e.*, whenever the plants are known to be attacked, not when they are dying off. (3) Make a hole (with a stick), beginning 3 or 4 in. from the plant, and passing down in an oblique direction till a point is reached rather below the root. (4) Pour in a teaspoonful of bisulphide of carbon for each plant treated and quickly stamp the soil in over the hole and press down. (5) The material must not touch the roots: the liquid will harm the plant but the vapour is harmless.

The plants treated will be quite free from any poisonous properties and thoroughly wholesome. If the pest be taken in time one injection should be enough.

The Board will be glad to receive particulars of any experiments in the use of this material. The following are the points which should be noted :—(*a*) The date and mode of treatment, the date when seed was sown, when damage was first noted, and the age of the plants at the time ; (*b*) General result of the experiment with a comparison between treated and untreated area. The dates and other particulars should be written down at the time and not given from memory.

An experiment carefully performed on these lines would be of value.

Industrial Alcohol Committee.

The Departmental Committee appointed to inquire into the existing facilities for the use of spirits in arts and manufactures took some evidence on the question of the production of spirit from potatoes. This subject has also been investigated by the Irish Department of Agriculture, and reference was made to conclusions arrived at in this *Journal* for March last (p. 733), which were practically identical with those of the Industrial Alcohol Committee, viz., that in the present agricultural con-

ditions of this country it would not be possible to found a profitable industry on the employment of potatoes as a material for distillation.

Those interested in the subject of alcohol distillation from potatoes will find some particulars of the German system, which may be read with what has already appeared in this *Journal*, in a Report of a visit to Germany by Sir Henry Primrose, C.S.I., K.C.B., and Dr. Thorpe, C.B. A description is given of an agricultural distillery, and it is observed that the production of spirit in Germany is a State-aided enterprise, of which the primary purpose is not so much the production of spirit on economic lines as the encouragement of agriculture in the less fertile provinces of the Empire which lie on its eastern frontiers, and in which the conditions of soil and climate are so unfavourable that without some such encouragement the country would be in serious danger of depopulation. The vast majority of the agricultural distilleries are to be found in the eastern provinces of Prussia and Saxony, where the soil is poor and the cost of conveying agricultural produce to a remunerative market is high. In normal years the return from the potatoes used does not exceed 25s. per ton (exclusive presumably of bonuses), and in many cases is less. The average is about 20s. per ton. The yield of alcohol from a ton of potatoes may be taken at about 25 gallons of pure alcohol, or about 44 proof gallons.

Live Stock Import Regulations—Germany.*

The regulations affecting the importation of live stock into Germany are given annually in the *Jahresbericht über die Verbreitung von Tierseuchen.* A summary of the principal points affecting animals imported from this country is given below.

The importation of animals suffering from infectious or contagious disease is prohibited, and all animals which are found on veterinary examination to be affected with contagious disease, or which are suspected of being so affected, and those which have been forwarded or have been in contact with them will be refused admission.

* Live stock import regulations have been published in this *Journal* for the following countries :—United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; and New South Wales, April, 1905.

All horses, asses, mules, ruminants, and swine arriving by land or sea, either for importation or through transit, must be submitted at the port or place of arrival to a careful examination by the Official Veterinary Surgeon. The cost must be borne by the importer. To facilitate the examination the importation must take place at certain fixed ports (or frontier Custom Houses). The following ports are prescribed for animals imported by sea, viz., Hamburg, Altona-Bahrenfeld, Apenrade Flensburg, Kiel, Lübeck, and Rostock-Warnemünde, at which places a veterinary inspection of the animals can be made, and where quarantine stations are also provided. The first inspection is to take place on board ship. This limitation, however, does not apply to horses, asses, and mules, or to animals for breeding purposes, trained animals, and animals for zoological gardens, parks, and other similar places which have obtained special permits, or to swine. The importation of these animals is subject to certain local regulations.

Ruminants and swine arriving by sea from foreign countries must on landing after examination by the Veterinary Officer undergo a quarantine of four weeks at the cost of the importer before they are permitted to be slaughtered (within or without the port) or are allowed to enter the ordinary trade channels. Danish, Norwegian, and Swedish cattle are only subjected to ten days' quarantine. Cattle, sheep, and pigs which after undergoing quarantine are permitted to leave, are to remain under observation at the place of destination for a further period of five months, but without interfering with the owner in the disposition of the animals.

The central authority of the State in which the entry is to take place is authorised, in conjunction with the central authority of the State to which the consignment is addressed, to permit the entry without quarantine of breeding animals, trained animals, and those intended for zoological gardens, parks, and other such places, when such animals have not been shipped with animals liable to quarantine. The latter authority has power, according to circumstances, to make regulations for the control at the place of destination of animals admitted without quarantine.

The importation and through transit of ruminants and swine

from the United Kingdom is prohibited by local and provincial regulations in Prussia, Mecklenburg-Schwerin, Oldenburg, Lübeck, Hamburg, and Bremen. Exemption from this prohibition is granted in the case of breeding sheep or breeding swine. Such animals, if they have not been shipped with animals liable to quarantine, are exempt from quarantine, and the admission is made dependent only on the veterinary examination at the place of entry. Proposals for the admission of such animals must be addressed to the central authority of the State to which the consignment is to be sent. The applicant must then apply to the central authority of the State through which the entry is to take place for the admission of the animals, producing the permission of the first-named authority.

The importation and through transit of horses from the United Kingdom is restricted by local and provincial regulations in Prussia, Mecklenburg-Schwerin, Oldenburg, Lübeck and Bremen. Horses for importation must be examined at the landing place (or on board ship) as to their state of health by an Official Veterinary Surgeon, and those suffering from or suspected of contagious disease will be refused admission.

All cattle received in the quarantine stations must be examined for tuberculosis and other diseases and undergo the tuberculin test. Those which react will be turned back after being branded on the left hind-quarter. The importer is bound to remove these animals by sea as soon as possible, and if this is not done by a given day the police authorities must have the animals destroyed. A fee of 1s. 6d. must be paid for the tuberculin test in addition to the quarantine fee.

The Horse Bot Fly.

The Horse Bot Fly (*Gastrophilus equi*) is common in the North of Scotland and in horses imported from Norway and the Danubian countries. Its life history is as follows:—During summer the female attaches her conical eggs by a viscid substance to the hair of the mane, neck, shoulders, and fore-legs of the horse, where—especially on dark-coloured horses—the eggs may frequently be found. In a week or ten days the eggs hatch,

and the larvæ so irritate the skin that the horse seeks relief by licking, and in this way the maggots get into the mouth and finally into the stomach and intestines, to the walls of which they firmly attach themselves by means of prominent mouth-hooks; there they live all through the autumn, winter, and spring, and cause great irritation and inflammation. In the early summer they may be found in abundance in the rectum. Finally they release their hold and pass out in the dung, where they pupate about June, and about a month later the imago appears.

Some observations on this insect have been made by Mr.

FIG. 1—LARVA OF GASTROPHILUS EQUI EMERGING FROM THE EGG-CASE.

Alex. Meek, M.Sc., F.Z.S., who has communicated the following note on the subject to the Board.

Specimens of the bot worm of the horse were obtained in 1894 from various parts of Aberdeenshire, and subsequently hairs from horses with the attached eggs. These all proved to belong to the species *Gastrophilus equi*, Fabr., and probably this is the only species which attacks the horse in that part of Scotland.

The accompanying photographs show (1) the larva emerging from the egg-case, and (2) the bots attached to the stomach of the horse. Among many eggs which were hatched with the aid of

a gentle heat, the larva typically and usually assumed the position of that in Fig. 1. It is therefore quite possible that some or many of the larvæ are licked up by the tongue of the horse without entirely leaving the egg. The stomach figured in the other photograph was obtained from the slaughter-house at Aberdeen. It shows not only the bots *in situ*, but the pitted thickened regions formed at the point of attachment.

It is rather remarkable that although a species of *Gastrophilus* is again very common in the middle and South of England, bots are altogether absent from the most northern portion of England, at all events, apparently, from Northumberland and Durham. The larvæ are only seen in those counties in horses

FIG. 2.—BOTS ATTACHED TO THE STOMACH OF A HORSE.

and ponies imported from regions where the insect naturally occurs. In spite of the fact that the larvæ are thus constantly introduced, for some reason not at all apparent none of the species manages to establish itself. A case has been reported, however, in which the larvæ appeared during the succeeding season in such an imported animal, but without any other horse being affected either then or subsequently.

It would be interesting to know what species actually do occur in the British Islands, and further observations are necessary as to the behaviour of the horse when the insect is ovipositing. In Aberdeenshire, so far as could be gathered, the horse does not appear to take any notice of the proceeding. Continental

writers, *e.g.* Neumann, state also that the egg-laying is done without the horse being disturbed. On the other hand, observers in the South of England and in America record instances of the horse flinching and attempting to escape from the insect. It is possible that the different observations are correct, and that the horse mistakes the attack of the bot fly for that of one of the *Tabanidæ*, but more facts from regions where the insect is common and well known are wanted before the discrepancy can be explained.

Belgian Butter Regulations.

The Belgian legislation forbids the sale of adulterated butter and of butter which is "abnormal" according to certain standards fixed by regulation in October 1903. The regulations were altered in September, 1904, as regards the subject of water in butter,* and they have now been further amended with reference to the definition of 'abnormal butter." The new regulation states that butter will be regarded as abnormal in composition, differing from pure butter in general, when the value of the volatile and soluble acids as determined by the Reichert-Meissl method falls below the number 28, and when, in addition, the butter also indicates one of the following factors: a refractive index (Abbe-Zeiss) above 44 at 40° C.; a critical temperature above 57° C. of solubility in alcohol at 99·1° G.L.; a density less than 0·865 at 100° C.; a percentage of insoluble and fixed fatty acids (Hehner) greater than 88·5 per cent.; a saponification number (Koettstörfer) below 222. Butter of which the purity has not been established by means of an official control of its production cannot be prepared for sale, carried, retailed, exposed, or detained for sale or delivery.

The Board have been officially informed that, as regards imported butter which is "abnormal," the Belgian authorities will take into consideration any guarantee of purity or analytical data which may be supplied by foreign Governments, but that if the Belgian importers are unable to produce such official evidence the suspected butter will not be admitted.

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* *Journal of the Board of Agriculture*, Vol. XI., p. 494.

Preparation of Fruit Pulp.*

Pulping is a useful method of dealing with fruit in wet seasons when it would otherwise quickly spoil; or in periods of glut and low prices when it is desired to keep the fruit in a form in which it can be sold for manufacture into jams or preserves at favourable opportunities. In ordinary seasons it would more often pay the grower better to sell his fruit raw than to pulp it; but there is always a certain quantity of damaged soft fruit which, while not fit for sale raw for table use, is suitable for conversion into pulp.

The varieties of fruit pulps for which there is the greatest demand are raspberry, apricot, currant, plum, greengage, and gooseberry. There is also a market for apple pulp in seasons when other fruit is scarce.

The plant necessary for pulping on a moderate scale for the wholesale trade does not involve a very large outlay of capital. A large shed divided into two rooms will usually afford ample accommodation for the fittings and utensils required. In one room the fruit is boiled in small copper vats, of a capacity of 30 gallons each, which are arranged against the wall, the remaining space being occupied by the casks and other receptacles into which the boiled pulp is poured and allowed to cool. The second room contains the boiler which generates the steam for heating the copper vats, and in this room the casks, jars, tins, &c., containing the pulp are finally closed and made ready for market.

Any type of boiler is suitable so long as it will produce steam readily at a small expenditure of coal.

The vats consist of copper pans with outer jackets or pans of iron, upon the rims of which the inside copper pans are suspended. Between each inner and outer pan there is a space of half an inch in which the hot steam circulates. The vats are supported on uprights fitted with brackets which allow them to be turned for emptying or filling as the case may be. Sometimes the pans are heated by hot water instead of by steam, but this system is not considered so satisfactory.

The method of dealing with various kinds of fruit may now be described. It should be noted that the better the quality of the fruit the better will be the pulp.

* An account of the methods employed in the preparation of fruit pulp in France appeared in this *Journal* for January, 1905, p. 621.

In the case of hard fruits such as apples and pears the fruit is first cut up into small pieces without being peeled and without removing the cores or seeds. For the finer kinds of jellies it is, however, better to grind or crush the fruit in a pulping machine. The pieces of fruit are afterwards put into cold water to prevent them turning brown, and if they show a tendency to discolour quickly, salt is added to the water at the rate of rather over $1\frac{1}{2}$ oz. to the gallon. The next step is to deposit the cut fruit in the vats in which it is boiled with a little added water until it becomes quite soft. This operation is assisted by the use of a wooden stirrer. When the fruit has been boiled to a pulp it is strained through cow-hair sieves which remove all the coarse parts, cores and seeds. The strained pulp is then again boiled and continually stirred until it is of such a consistency that it will hang without dropping from a silver spoon dipped into the mass.

Apples or pears will usually yield a fifth of their weight in pulp. If very hard or unripe fruit is used sugar should be added at the rate of $\frac{1}{2}$ to $1\frac{1}{2}$ lb. per 10 lb. of fruit as required.

For plums and soft fruits the process is almost identical with that described above. Ripe plums, the fruit of which separates easily from the stones, make the best pulp. The plums are put into the copper vats described above, and sufficient water is added to cover the top layer of fruit. The process of boiling is then proceeded with, the contents of the vats being constantly stirred until the whole becomes a pulpy mass. This is then poured through a cow-hair sieve to remove the skins, stones, and coarse particles, and the strained pulp is again boiled; but at this stage sugar is usually added at the rate of $4\frac{1}{2}$ lb. to each cwt. of fruit converted into pulp. The boiling and stirring are continued until the pulp is thickened sufficiently to hang from a spoon without dropping.

For raspberries and strawberries the boiling must not be prolonged, and the pulp need not be strained through so fine a sieve as in the case of plums.

The scum must in all cases be skimmed from the pulp at the first boiling, and this operation should never be neglected in the pulping of stone fruits.

Fruit pulp can be prepared without the addition of sugar,

though sometimes a small quantity is added in the proportions described above. The usual practice, however, is to pour a solution of sugar (in the proportion of $1\frac{3}{4}$ lb. of cane sugar to $\frac{1}{2}$ gallon of hot water) over the pulp after the latter has been placed in the jars or other receptacles and immediately before these are closed.

When no sugar is added to the pulp the latter is well shaken down in the jars or tins, which are then placed for a short time in a warm oven until a hard layer has formed on the top of the pulp.

The jars, tins, or bottles intended to hold the pulp must be thoroughly cleaned before being used. They should be first well washed out with hot water, then rinsed with tepid water containing a little salicylic acid, and afterwards dried. It is a good practice to limewash the walls of the shed in which these receptacles are cleaned. Small casks used for pulp are sometimes treated for four or five minutes with a solution of 1 oz. of bisulphite of lime dissolved in a quart of water.

Tins are the most suitable receptacles for the storage of pulp. After being filled they are soldered down and boiled in water, which makes it possible to detect any tins that are not air-tight. Tins take up very little room and preserve the pulp for a considerable period.

Glass bottles are sometimes used—the best are those which are closed with glass stoppers or flat glass plates and afterwards tied down with parchment paper, and there is an improved form of bottle which can be hermetically sealed. The bottles must be boiled after the pulp has been put into them.

Casks are occasionally used for pulp which is to be stored for some time, but they are chiefly employed for the cheaper kinds, such as apples and plums.

Large stoneware jars are commonly used for the storage of soft fruit pulps. It is usual to place a piece of parchment paper saturated with spirit on the top of the pulp, and to cover the corks in the jars with parchment paper.

A cool dark shed with a tiled roof is the best storage place for pulp, and the jars or other receptacles should be placed on open shelves round the walls so that the air may have free access to them.

The principal points to which care should be devoted are the processes of boiling the fruit. The first boiling should be continued only so long as the consistency of the mass is such as will enable the pulp to pass through the sieve for straining, and at the second boiling the pulp must not be allowed to get too thick, otherwise it will acquire a bitter flavour.

The Goat Moth and the Wood Leopard Moth.

The Goat Moth (*Cossus ligniperda*).—The caterpillars of this moth bore galleries in the stems of many species of broad-leaved trees, *e.g.*, willow, poplar, walnut, birch, elm, beech, lime, sycamore, ash, and various fruit trees. The softer woods are more commonly infested.

The caterpillars are large, and a great number may be found at work in the same tree; the wood, on this account, is so tunnelled and honeycombed as to be rendered useless for technical purposes. Indications of infestation are:—(*a*) The little heaps of excrement and frass thrown, by the feeding caterpillars, from their galleries to the outside. (*b*) The tunnelled stems broken by the wind. (*c*) The odour of the caterpillars (the walls of the galleries in the wood also smell), the odour being that of the acid distilled from wood; by some the odour has been compared to that of the goat.

Isolated trees or those in an avenue or at the edge of a wood are chosen by the females for their egg laying in preference to trees in close-forest or close growth.

Description of Moth.—The goat moth is large and plump, and flies at night. The female measures $1\frac{1}{2}$ in. and over in length, and over 3 in. in spread of wing; the male is somewhat smaller. The head is small and the eyes large; proboscis and antennæ are short. The antennæ of the male are distinctly comb-like, those of the female, saw-like. The fore wings are pale brown mottled with ashy-grey, and have numerous irregular black streaks and marks; the hind wings are darker greyish-brown. The thorax is densely hairy, brown and grey in front, and with a blackish band across it behind. The large heavy abdomen is grey with whitish rings.

The caterpillar is somewhat flattened, so that the galleries are oval in shape. When young the caterpillar is dull pink, but as it grows it becomes yellowish flesh-coloured at the sides and under surface, the upper surface being red. The head is black; on the segment behind the head is a dark shield; the segments have fine bristle-like hairs. The full-grown caterpillar may measure about 4 in.

Pupation takes place in the burrow in the stem, near to the outside, the chrysalis being surrounded by a cocoon covered by wood chips and sawdust. Sometimes the caterpillar leaves the tree and pupates in the soil, in which case the cocoon consists chiefly of particles of soil.

Life History.—The moths fly in June and July; the eggs are laid in little heaps in cracks and crevices in the bark, generally very low down, but sometimes up to the height of a man. The caterpillars, on hatching, feed at first below the bark, but later they gnaw irregular ascending galleries in the wood. In cases of overcrowding (and more than 100 caterpillars have been taken from one stem) some of the caterpillars may leave the tree and bore into another. When full-grown the caterpillar pupates and the pupation stage lasts about a month, or occasionally somewhat longer. Before the emergence of the moth, the pupa pushes its way partly out of the burrow in the tree, and the empty pupal skin may be seen projecting after the emergence of the moth. The cocoons have been taken from the soil of a garden near an infested balsam poplar.

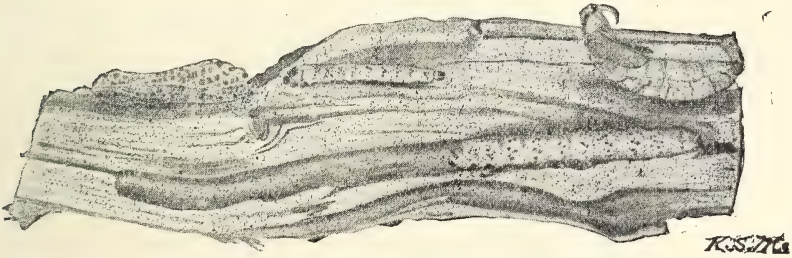
The life cycle typically lasts for two years, *i.e.*, from eggs laid in July, 1905, caterpillars will hatch and bore below the bark; after wintering in the stem the caterpillars will tunnel in the wood, where they will live during the whole of 1906 and till June of 1907, when pupation will take place, the moths issuing to start a new generation in July, 1907.

The Wood Leopard Moth (*Zeuzera aesculi*).—The caterpillars of this moth feed in the stem and branches of a number of broad-leaved species of trees, *e.g.*, lilac, lime, sycamore, birch, beech, oak, sweet chestnut, ash, willow, poplar, and such fruit trees as apple, pear, and cherry, where they may cause considerable harm.

The moth, though its specific name is that of the horse-

chestnut, does not lay so much in it as in other trees, but its caterpillar-galleries have been found several times in the very young branches of this tree, the tunnelled twigs hanging down broken by the wind.

In the case of this moth, the caterpillars are not found many together in an attacked stem, but generally singly. The presence of the caterpillar may be betrayed by its copious outthrow of frass and wood-coloured excrement. The moth is frequently found in the Metropolitan districts, and sometimes causes considerable destruction to trees and shrubs in the public parks and private gardens of the Metropolis.



THE WOOD LEOPARD MOTH.—Figure showing young caterpillar, well-grown caterpillar pupa case, moth at rest and a larval gallery.

Description.—The moth, which is named "Leopard," on account of its spotted wings, measures between two and three inches in expanse of wings in the case of the female, the males being smaller. The fore wings are white, with a number of black or blue-black spots. The hind wings are similarly marked, but the spots are fainter. The thorax is white, with six large dark spots arranged in pairs and a smaller one between the hindmost pair.

The full-grown caterpillar may measure two inches. It is white or yellow-white in colour with black spots; the head is dark, the joint behind the head has a black shield or plate, and a black plate is also present on the last segment.

The pupa is brown and may by found at first just below the place of exit, and later, empty from the emergence of the moth, the case may—till the weather destroys or displaces it—be seen projecting from the tunnel in the infested tree.

Life History.—The moths lay their eggs singly on stem and branches in late June or July, and the caterpillar on hatching

gnaws at first irregularly below the bark. After wintering the caterpillar bores into the wood, and the gallery or tunnel, running in the axis of the infested stem, is round and regular and may reach eight inches in length. The life cycle takes two years for its completion, and the dates quoted for the Goat Moth apply also for the Wood Leopard Moth. The caterpillars have been known to leave their first feeding place and attack younger and fresher growths.

Preventive and Remedial Measures.—1. Leopard Moth caterpillars in young branches or young stems: as these stems or branches would probably be killed in any case, they should be cut and burned.

2. The galleries of the Wood Leopard caterpillars are regular in older stems, and a piece of wire or a strong twig pushed into the tunnel vigorously may reach and kill the caterpillar.

3. Trees infested with the goat moth caterpillars should be cut down and the brood destroyed.

4. As a preventive against the egg laying of the goat moth, smear or paint over the lower part of the stem, up to the height of a man, with a mixture of clay and cow-dung or a mixture of clay, soft soap and paraffin.

R. STEWART MACDOUGALL.

Committee on Small Holdings.

The President of the Board of Agriculture and Fisheries has appointed a Committee to enquire into the administration and working of the Small Holdings Act, 1892; to examine the various arrangements made by landowners in recent years for the provision of smaller agricultural holdings; and to report as to the conditions under which such holdings are most likely to be attended with success and as to the measures which may most advantageously be taken, either by legislation, co-operative association or otherwise, to secure the increase of their number

The Committee will be constituted as follows:—The Right Hon. the Earl of Onslow, G.C.M.G. (Chairman); the Right Hon. the Earl Carrington, G.C.M.G.; the Right Hon. Jesse Collings, M.P.; Sir Ralph Anstruther, Bart.; Major Patrick

George Craigie, C.B., an Assistant-Secretary to the Board of Agriculture and Fisheries; Mr. Charles Bidwell; Mr. William Brown; Mr. Francis Allston Channing, M.P.; Mr. James Long; Mr. John William Willis-Bund; and Mr. Robert Armstrong Yerburgh, M.P.

Mr. Thomas Hickling Sutton, of the Board of Agriculture and Fisheries, will act as Secretary to the Committee.

Committee on Epizootic Abortion.

The President of the Board of Agriculture and Fisheries has appointed a Departmental Committee to enquire, by means of experimental investigation and otherwise, into the pathology and etiology of Epizootic Abortion, and to consider whether any and, if so, what preventive and remedial measures may with advantage be adopted with respect to that disease.

The Committee is constituted as follows, viz.:—Professor John MacFadyean, M.R.C.V.S., M.B., B.Sc., Principal of the Royal Veterinary College, (Chairman); Sir Edward Strachey, Bart., M.P.; the Very Rev. Dr. John Gillespie; Mr. William Hunting, F.R.C.V.S.; Dr. George H. Falkiner Nuttall, F.R.S.; and Mr. Stewart Stockman, M.R.C.V.S., Chief Veterinary Officer of the Board of Agriculture and Fisheries.

Mr James Ralph Jackson, M.R.C.V.S, of the Board of Agriculture and Fisheries, will act as Secretary to the Committee.

Committee on Grouse Disease.

The President of the Board of Agriculture and Fisheries has appointed a Committee to inquire into the nature and causes of grouse disease, and to report whether any, and if so, what, preventive or remedial measures can with advantage be taken with respect to it.

The Committee will be constituted as follows:—The Marquis of Tullibardine, M.V.O., D.S.O.; Earl de Grey, K.C.V.O.; Lord Henry Montague Douglas-Scott; The Lord Lovat, C.V.O., C.B., D.S.O.; Mr. Dudley W. Drummond; Mr. James Graham;

The Mackintosh of Mackintosh; Mr. Ronald Craufurd Munro-Ferguson, M.P.; Mr. Reginald Henry Rimington-Wilson; Dr. William Somerville, an Assistant Secretary to the Board of Agriculture and Fisheries.

The Chairman of the Committee will be Lord Lovat, and Mr. A. S. Leslie, Secretary.

The cost of the enquiry will be defrayed by subscription and guarantees, and no charge in respect of it will fall upon public funds.

Harvest Weather Forecasts.

During the Harvest Season the Meteorological Office will as before, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment of the cost of the telegrams. The forecasts will be so worded that the cost of each message will be 6d. for any one district, including an address of three words. If the address to which the forecasts are to be sent exceeds three words, an addition of a halfpenny for each additional word must be made to the cost of the daily telegram.

The Harvest forecasts are prepared at 3.30 p.m. daily from June 1 to September 30 (except Sundays), and are applicable to the 24 hours from midnight following the time of issue.

Applications for the forcasts may be made on a form, which can be obtained from the Secretary, Meteorological Office, 63, Victoria Street, London, S.W.

In view of the importance of checking the accuracy of the Harvest forecasts, the Office will be glad to supply, to those recipients who signify their willingness to co-operate in the matter, forms on which records of the weather experienced may be entered for the purpose of enabling the Office to compare the forecasts with the subsequent weather.

The service of Harvest forecasts is arranged for *consecutive* telegrams only, and is in addition to the ordinary service of daily forecasts prepared at the Office at 11 a.m. and 8 p.m. Within these hours the latest forecasts for any particular day can be obtained by telegraph upon payment at any Post Office of a fee of 6d. in addition to the cost of the inquiry and reply telegrams.

ADDITIONS TO THE LIBRARY DURING APRIL.

Africa—

Egypt.—Commerce Extérieur, 1904. (153 pp.)
East Africa Protectorate.—Reports from Director of Agriculture for 1904, and on the Prospects of Settlers. [Cd. 2410.] (49 pp.)
Transvaal.—Department of Agriculture, Report, 1903-4. (382 pp.)
Transvaal.—Commissioner of Lands' Department Report, 1903-4. (416 pp.)
Cape of Good Hope.—Acting Surveyor-General, Report, 1903-4. (69 pp.)
Cape of Good Hope.—Reports for half-year ended 30th June, 1904:—Chief Inspector of Sheep (50 pp.); Government Entomologist (35 pp.); Agricultural Assistant, Cape Town (21 pp.); Superintendent of Government Guano Islands (4 pp.); Horticultural Assistant (4 pp.).

Australia—

New Zealand.—Agricultural and Pastoral Statistics—Estimated Yields, 1904-5.
New Zealand.—Corn and Green Crops, complete returns, 1904-5. (40 pp.)
Western Australia.—Census, 1901. Vol. III. (31 maps.) 1904.

Belgium—

Recensement Agricole, 1903. (261 pp.); 1904. (322 pp.)

Canada—

Lumsden, J.—Through Canada in Harvest Time. (363 pp.) 1903.
Montagu, E. S., and Herbert, B.—Canada and the Empire. (198 pp.) 1904.
Bradley, A. C.—Canada in the Twentieth Century. (428 pp.) 1903.
Ontario Agricultural College.—Bull. 139. Experimental Shipment of Fruit to Winnipeg. (24 pp.) 1905. Bull. 140. Results of Field Experiments with Farm Crops. (62 pp.) 1905.
North-West Territories.—Report on Grain Crops, 1904. (14 pp.)
Department of Agriculture, Ontario.—Report, 1903. 2 vols.

France—

Lezé, R.—Préparation et Maturation des Caillés de Fromagerie. (115 pp.) 1905.

Germany—

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft 102:—Zucht, Fütterung und Haltung des Schweins in Nordamerika. (70 pp.) 1905.
Preussische Central-Genossenschafts-Kasse.—Jahr-und Adressbuch der Erwerbs- und Wirtschafts-Genossenschaften im D. Reiche, 1904. (442 pp.)
Wurtembergische Jahrbücher für Statistik und Landeskunde, 1904. (207 pp.)
Jahrbuch des Vereins der Spiritus-Fabrikanten in Deutschland, 1905. (470 pp.)

Great Britain—

Stein, Sigmund.—Sugar Beet Growing Experiments in Great Britain and Ireland, 1904. (11 pp.)
Grahams, A. B.—Suggestion in favour of Co-operative Dairying in Scotland. (13 pp.) 1905.
Sanders, T. W.—Book of the Potato. (222 pp.) 1905.
Snell, F. C.—Camera in the Fields. (256 pp.) 1905.
Elliot, R. H.—Agricultural Changes and Laying Down Land to Grass. (197 pp.) Third Edition. 1905.
Departmental Committee on Industrial Alcohol.—Report. [Cd. 2472.] (27 pp.) Minutes of Evidence. [Cd. 2477.] (284 pp.) 1905.
Highland and Agricultural Society of Scotland.—Transactions. Vol. XVII. 1905. (513 + 86 pp.)
Edinburgh and East of Scotland College of Agriculture.—Manuring of Seeds Hay, Report, 1904. (19 pp.)
Northumberland C.C.—Report on Back House Rotation Experiment and on Finger-and-Toe on Swedes (42 pp.); Report on Varieties of Potatoes and on Manures for Potatoes. (10 pp.) 1905.
Armstrong College, Newcastle-upon-Tyne.—Manuring of Swedes and Potatoes. Report, 1904. (18 pp.)
University College, Reading.—Report of Field Trials and Experiments, 1904. (40 pp.)
University of Leeds.—Tests with Varieties of Oats and Barley at Garfort 1904. Report. (18 pp.)
Vacher, F.—Food Inspector's Handbook. (231 pp.) 1905.

India—

Department of Agriculture, Punjab.—Report, 1903-4.

Italy—

Giglioli, I.—Frodi nei Concimi, Mangimi e nelle Sementi. (758 pp.) 1905.
H.M. Victor Emanuel III., King of Italy.—Proclamation proposing an International Chamber of Agriculture. (30 pp.) 1905.

Sweden—

Hushållningssallskapens Berättelser för år, 1903.
Meddelanden angående den med statsmedel understödda Hastpremieringen. (165 pp.) 1905.
Årsberättelse från Veterinar-Institut, 1904. (85 pp.)

Switzerland—

Comité Directeur de l'Union Suisse des Paysans. Rapport, 1904. (47 pp.)
Résultats du Recensement Fédéral du Bétail, 19 Avril'01. (2 vols.) (196 + 168 pp.) 1903–5.
Statistisches Jahrbuch, 1904. (366 pp.)

West Indies—

Department of Agriculture.—Sugar-Cane Experiments, Leeward Island, 1903-4. Summary of Results. (61 pp.)
Barclay, J.—Rabbit-Keeping in the West Indies. (29 pp.) 1905.

United States—

Bureau of Animal Industry.—Bull. No. 52. Experiments concerning Tuberculosis. Part II. Comparative Virulence of Human and Bovine Tubercle Bacilli for some large Animals. (100 pp.) 1905.
Bureau of Chemistry.—Bull. 89. Injury to Vegetation by Smelter Fumes. (23 pp.) 1905.
Bureau of Entomology.—Circ. 57. Greenhouse White Fly. (9 pp.) 1905.
Farmers' Bulletins:—
  No. 213. Raspberries. (38 pp.) 1905.
  No. 214. Beneficial Bacteria for Leguminous Crops. (48 pp.) 1905.
  No. 216. The Control of the Boll Weevil. (32 pp.) 1905.
  No. 217. Essential Steps in Securing an Early Crop of Cotton. (16 pp.) 1905.
  No. 219. Lessons from the Grain-Rust Epidemic of 1904. (24 pp.) 1905.
Bureau of Forestry:—
  Circ. No. 21. Practical Assistance to Farmers in handling Forest Lands. (4 pp.) 1905.
  Circ. No. 22. Practical Assistance to Tree Planters. (4 pp.) 1905.
  Circ. No. 33. What Forestry means to Representative Men. (31 pp.) 1905.
  Bull. No. 55. Forest Conditions of Northern New Hampshire. (100 pp.)
Bureau of Plant Industry:—
  Bull. No. 73. The Development of Single-Germ Beet Seed. (23 pp + 8 plates.) 1905.
  Bull. 74. The Prickly Pear and other Cacti as Food for Stock. (46 pp. + 5 plates.) 1905.
Bureau of Soils:—Field Operations, 1903. (1,310 pp. + 78 maps.) 1904.
Bureau of Statistics.—Marketing Goods in Foreign Countries. (164 pp.) 1905.
  Bull. No. 31. Imports of Farm and Forest Products, 1901-3. (66 pp.) 1905.
Kansas State Board of Agriculture.—Biennial Report, 1903-4. (1,037 pp.)
New Jersey Experiment Station:—
  Bull. No. 180. Accumulation and Utilisation of Atmospheric Nitrogen in the Soil. (37 pp.) 1905.
  Bull. No. 181. Insects Injurious to Shade Trees and Ornamental Plants. (50 pp.) 1905.
Wisconsin Experiment Station.—Report for year ending 30th June, 1904. (392 pp.)
  Bull. No. 115. Quality of Cheese as affected by Rape and other Green Forage Plants Fed to Dairy Cows. (16 pp.) 1904.
  Bull. No. 116. Relation of Food to the Production of Milk and Butter-fat by Dairy Cows. (85 pp.) 1904.
  Bull. No. 117. Relation of Food to Dairy Production. (16 pp.) 1904.
  Bull. No. 119. Report on Cranberry Investigations. (77 pp.) 1905.
  Bull. No. 121. Alfalfa, or Lucerne. (22 pp.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of April, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 8	7 4	37 2	34 5
Herefords	7 9	7 1	—	—
Shorthorns	7 7	7 1	36 2	33 7
Devons	7 9	7 4	—	—
	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
Veal Calves	8¾	8	8½	7¼
Sheep :—				
Downs	9	8½	8½	7¾
Longwools	8¼	7½	8¼	7¼
Cheviots	9½	8¾	9½	8¼
Blackfaced	9	8¼	8¾	7¾
Cross-breds	8¾	8	9¼	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 5	6 0	6 6	5 11
Porkers	6 10	6 6	7 0	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 4	17 3	20 8	16 6
,, —Calvers ...	19 5	16 12	18 9	15 7
Other breeds—In Milk ...	21 0	15 1	17 18	14 3
,, —Calvers ...	17 6	13 5	17 18	14 14
Calves for Rearing	2 3	1 15	2 15	1 18
Store Cattle :—				
Shorthorns—Yearlings ...	9 5	8 5	10 8	8 7
,, Two-year-olds	13 9	11 19	15 2	13 2
,, Three-year-olds	16 12	14 18	17 6	15 7
Polled Scots—Two-year-olds	—	—	17 3	14 5
Herefords— ,,	16 1	14 10	—	—
Devons— ,,	13 0	11 4	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	49 9	43 0	—	—
Scotch Cross-breds ...	—	—	38 0	34 2
Store Pigs :—				
Under 4 months	27 4	20 10	25 2	18 10

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	53 0	52 0	52 0	51 6	53 6*	51 6*
	2nd	50 6	47 0	47 0	45 6	50 6*	47 6*
Cow and Bull ...	1st	—	45 0	44 6	43 0	44 6	41 0
	2nd	—	40 0	39 6	35 6	38 0	34 6
U.S.A. and Canadian :—							
Birkenhead killed	1st	50 0	51 0	49 0	49 0	—	49 0
	2nd	48 0	46 6	44 6	43 6	39 6	39 6
Argentine Frozen—							
Hind Quarters ...	1st	29 0	30 0	30 0	27 6	30 0	29 0
Fore ,, ...	1st	22 6	24 0	23 0	22 6	25 0	23 6
Argentine Chilled—							
Hind Quarters ...	1st	43 0	39 0	39 6	36 0	—	39 6
Fore ,, ...	1st	28 6	27 6	27 6	26 6	—	31 6
American Chilled—							
Hind Quarters ...	1st	56 0	52 6	52 0	50 0	53 6	54 0
Fore ,, ...	1st	33 0	35 0	33 6	32 6	37 6	35 6
VEAL :—							
British	1st	69 0	68 6	73 6	73 6	—	67 6
	2nd	56 0	57 0	68 0	65 0	—	—
Foreign	1st	68 6	—	63 6	59 6	—	63 6
MUTTON :—							
Scotch	1st	75 0	—	81 6	78 6	74 0	73 6
	2nd	66 6	—	74 6	70 6	67 6	62 0
English	1st	69 6	69 0	75 6	74 0	—	—
	2nd	62 0	58 0	69 0	66 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	65 6	67 6	64 0	65 6	—
Argentine Frozen ...	1st	33 6	35 0	35 0	35 0	34 0	34 6
Australian ,, ...	1st	31 0	32 0	30 6	32 0	35 0	—
New Zealand ,, ...	1st	44 6	40 6	44 6	43 0	37 6	—
LAMB :—							
British	1st	103 6	98 0	110 0	110 0	—	112 0
	2nd	90 0	84 0	97 0	92 0	—	—
New Zealand ...	1st	54 0	56 0	54 6	55 6	58 6	60 6
Australian	1st	47 6	48 0	44 6	45 6	46 6	—
Argentine	1st	44 6	45 6	46 6	45 6	—	46 6
PORK :—							
British	1st	61 0	60 6	59 0	57 6	56 0	54 0
	2nd	52 6	52 0	55 0	50 0	53 6	48 0
Foreign	1st	59 6	54 6	54 6	52 6	—	48 0

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1905, and in the corresponding Weeks in 1904 and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ...	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1		22 5	19 10		18 4	16 6	
,, 20 ...	27 10	26 9		23 7	20 4		18 5	16 7	
,, 27 ...	27 8	26 9		23 7	19 8		18 5	16 7	
June 3 ...	27 6	26 10		23 10	18 8		18 4	16 8	
,, 10 ...	27 8	26 6		21 5	18 5		18 7	16 10	
,, 17 ...	27 6	26 5		20 7	18 2		18 3	16 8	
,, 24 ...	27 6	26 5		22 0	19 2		18 6	16 10	
July 1 ...	27 9	26 4		20 7	18 8		18 6	17 1	
,, 8 ...	28 1	26 6		19 11	19 8		18 3	17 1	
,, 15 ...	28 3	26 10		20 5	18 9		18 7	17 6	
,, 22 ...	28 7	27 7		20 10	18 10		18 5	17 6	
,, 29 ...	28 11	28 0		21 0	19 9		18 6	17 10	
Aug. 5 ...	29 3	28 3		20 1	19 9		18 8	17 10	
,, 12 ...	29 11	28 4		21 3	19 9		18 10	17 7	
,, 19 ...	29 9	28 8		20 4	22 5		18 6	16 7	
,, 26 ...	30 0	29 5		22 3	23 2		18 7	16 5	
Sept. 2 ...	30 3	30 2		22 5	25 3		18 5	16 3	
,, 9 ...	28 6	30 0		22 4	24 10		17 0	16 1	
,, 16 ...	27 5	29 7		24 2	24 9		16 4	15 11	
,, 23 ...	27 0	29 10		24 0	25 10		16 2	15 9	
,, 30 ...	26 3	29 10		23 9	25 5		15 9	15 8	
Oct. 7 ...	25 10	30 2		23 8	25 6		15 6	15 9	
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ...	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1904.	Wheat. 1905.	Barley. 1904.	Barley. 1905.	Oats. 1904.	Oats. 1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	March ...	37 1	39 10	22 5	24 0	16 10	19 4
	April ...	36 9	40 4	22 2	24 6	16 8	19 9
Paris:	March ...	37 4	40 2	21 9	25 0	16 1	19 11
	April ...	37 5	41 3	21 0	25 9	16 5	20 5
Belgium:	March ...	30 6	30 10	21 5	23 8	15 5	20 6
Berlin:	February ...	37 0	38 6	—	—	18 3	20 2
Breslau:	February ...	35 4	36 1	22 3	26 5	15 11	19 10

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of April, 1904 and 1905.

—	Wheat. 1904.	Wheat. 1905.	Barley. 1904.	Barley. 1905.	Oats. 1904.	Oats. 1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	28 3	31 2	20 3	23 1	16 9	18 3
Norwich	28 10	31 2	22 0	24 4	15 6	16 8
Peterborough ...	26 5	30 2	19 7	23 4	15 1	17 1
Lincoln	26 9	29 9	21 7	22 9	15 11	16 7
Doncaster	26 3	29 0	21 9	24 6	16 3	16 5
Salisbury	28 3	30 5	21 8	23 2	16 9	17 7

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	13 0	12 0	—	—	—	—	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	102 0	98 0	—	—	—	—	—	—
Danish ...	106 6	104 6	110 0	106 6	108 6	106 0	108 0	—
Russian ...	101 0	99 0	106 6	103 0	—	—	99 0	—
Australian ...	100 6	98 0	103 0	101 0	101 0	99 0	104 6	—
New Zealand...	102 0	100 6	105 0	103 0	104 0	102 0	105 6	—
CHEESE :—								
British, Cheddar	74 0	60 0	—	—	70 6	64 6	61 6	58 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	67 0	57 6	67 0	62 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	59 0	58 0	59 0	56 6	57 6	56 0	59 6	56 0
BACON :—								
Irish	67 0	63 0	67 0	63 0	66 0	62 0	64 0	61 0
Canadian ...	57 0	53 0	53 6	48 0	55 0	49 6	57 0	53 6
HAMS :—								
Cumberland ...	98 0	80 0	—	—	—	—	—	—
Irish	97 6	80 0	—	—	—	—	91 6	81 6
American (long cut) ...	47 0	45 6	48 6	44 6	48 6	45 0	51 0	48 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	8 5	7 0	—	—	—	—	—	—
Irish	7 10	6 9	7 1	6 7	6 11	6 7	6 8	6 2
Danish ...	8 0	7 0	8 6	6 10	—	—	7 10	6 10
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	50 0	45 0	47 0	39 6	48 6	—	—	—
Main Crop ...	81 0	63 0	—	—	60 0	50 0	—	—
Up-to-Date ...	66 0	57 6	66 0	53 6	51 6	50 0	37 6	32 6
HAY :—								
Clover... ...	85 0	75 0	82 0	70 6	80 0	67 6	75 0	69 0
Meadow ...	75 6	62 6	69 6	61 6	57 6	45 0	71 0	64 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1905.	1904.	1905.	1904.
Swine-Fever:—				
Outbreaks	67	106	222	426
Swine Slaughtered as diseased or exposed to infection ...	383	558	1,138	2,428
Anthrax:—				
Outbreaks	83	68	360	338
Animals attacked	114	90	534	460
Glanders (including Farcy):—				
Outbreaks	103	119	388	488
Animals attacked	154	190	715	907
Sheep-Scab:—				
Outbreaks	58	55	605	998

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1905.	1904.	1905.	1904.
Swine-Fever:—				
Outbreaks	—	9	6	38
Swine Slaughtered as diseased or exposed to infection ...	113	226	309	898
Anthrax:—				
Outbreaks	—	—	2	2
Animals attacked	—	—	2	2
Glanders (including Farcy):—				
Outbreaks	—	1	9	3
Animals attacked	2	1	25	18
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	31	32	210	327

THE JOURNAL OF THE BOARD OF AGRICULTURE.

Vol. XII. No. 3.

JUNE, 1905. [NEW SERIES.]

HEDGEROW TIMBER.

There is probably no feature which renders the scenery of England more distinct from that of most European countries than the hedgerow timber trees, which are so regularly distributed over the fields and pastures of the more fertile parts of this country. The roadside trees of the Continent, with their regularity and uniformity as regards distance apart and species, may possess a certain amount of character, but the methodical style of planting destroys a great deal of the picturesque effect which is associated with English hedgerow trees. It may be true that many districts are to be found in England which, owing to poverty of soil or exposure to strong winds, do not possess hedgerow trees of any particular beauty or value, and in which they would not be greatly missed if they were taken away altogether. But there can be little doubt that the hedgerow timber of the Midlands and South of England generally, constitutes a feature which plays no unimportant part in forming the scenery or adding to the value of the land in rural districts. It has, no doubt, its disadvantages and drawbacks from an agricultural point of view, but taking everything into consideration, it will probably be found that its demerits are outweighed by its merits, and that a district well provided with hedgerow timber is more favourably situated than one without any.

The origin of hedgerow timber is more or less obscure. It is difficult or impossible to say what proportion of it was planted and what has originated spontaneously. Many of the older writers assume or imply that it was planted, and give

copious directions for the operation. No doubt a certain amount of hedgerow timber was planted, especially in the vicinity of the larger farm-houses or older manor-houses. But so far as the greater bulk of the ordinary hedgerow timber is concerned, neither records nor traditions exist regarding any such work having been done, although little of it can be more than two hundred years of age at the outside, and the greater proportion of it is not more than one hundred years.

Going back to the conditions which prevailed when most of the hedgerows of England were formed, however, it is not difficult to furnish an explanation of the presence of a great deal of the hedgerow timber in them. Two hundred years ago much of what is now enclosed ground existed in the form of commons or wastes, many of which contained a great deal of timber, which was claimed by the Lord of the Manor. Such commons, although little adapted for the artificial raising of trees, yet contained many odd corners or patches of gorse, brambles, thorns, &c., which acted as rough nurseries in which seedlings of oak, ash, sycamore, &c., or suckers of elm or poplar were able to reach a size which first rendered them safe against the attacks of cattle, and subsequently brought them to a size at which they could be classified as timber trees. When the constant encroachments upon these wastes were made by the copyholders of the manor such trees would be preserved in a general way, and as these encroachments usually took the form of long narrow strips or patches of ground, not exceeding an acre or so in extent, it is easily seen that a large number of trees must have stood in the line of the rough bank which separated the copyhold from the waste of the manor, and which thenceforth became hedgerow trees. In some cases, perhaps, trees may have been planted or specially retained as boundary marks, and as such were regarded as permanent landmarks.

Hedgerow timber once established in the above manner, its perpetuation would be a simple matter, bearing in mind the particular form in which hedges existed until quite recent times, and in which many of them exist now. The close, neatly-trimmed thorn or beech hedge is a very different thing to the old-fashioned bank and ditch, surmounted by a row of dead branches, thorns, or bushes, out of which was gradually evolved

the "stake and edder" fence, or the quickset hedge. Occasionally, especially along the boundary line of two neighbouring farms or estates, a narrow strip of ground was enclosed by a bank and ditch on either side, and was reserved for growing hazel, thorn, or other growth which could be used for "setting" the banks from time to time. The tops of these banks formed, and still form to this day, more or less suitable seed-beds for the seeds of most indigenous forest trees, while species such as English elm and poplar, which produce root suckers, will soon fill up such banks with a thick crop of saplings if left alone. Raised in this way, and attaining a height of six or eight feet, the preservation of such saplings would follow as a matter of course when the next cutting or laying of the hedge took place. A custom prevailed on many estates of paying the hedge-cutters one penny for every young sapling left when hedge-cutting, and the retention of such saplings is an understood thing in all cases, although carelessness and the instigation of the farmer may cause the disappearance of many.

At the present time the bulk of the hedgerow timber south of the Trent consists of English and Wych elm, oak, and ash. Of these the first-named is the most frequent species from Warwickshire southwards, except in certain districts which are characterised by stiff, sour clays, or by very poor or high-lying land, such as the Downs or Wolds. On clay land, or in districts which have only been cleared of natural woodland within comparatively recent times, the oak and ash are usually plentiful, while the Wych elm is abundant in Essex. These last three species also form practically the whole of the ordinary hedgerow timber in the Midlands and North of England, while sycamore also becomes more plentiful towards the North. Where other species occur, such as beech, black Italian poplar, &c., it may be taken for granted that they have been planted.

Taking English hedgerow timber as it is, there are three fairly distinct points of view from which it may be judged: 1st, its value as an ornamental feature of the landscape; 2nd, its importance in providing shade and shelter from hot sun or cold or strong winds to men, live stock, or crops; and, 3rd, its value as a natural source of wealth in rural districts.

The ornamental features of hedgerow trees depend almost

entirely upon the suitability of the soil and situation for the species grown. Shapely and well-developed trees, whatever the species may be, cannot fail to improve the landscape and render an otherwise bare or uninteresting country more or less picturesque. Stunted and misshapen specimens, on the other hand, invariably give a district a mean and monotonous appearance, and at once suggest a bleak climate or poor soil. They may afford a certain amount of shelter, but not sufficient to make good the damage done to hedges by low-crowned trees or the drain upon an already poor soil by their roots, while the value of the timber is practically *nil*. In such districts it is doubtful whether hedgerow timber in the form of single trees is worth having, and it is better to provide shelter by means of clumps, belts, or ordinary plantations.

The importance of hedgerow timber in the way of shade and shelter is difficult to estimate with any degree of accuracy. There can be little doubt, however, that hedgerow trees act as wind-breaks and prevent rapid evaporation from the surface. A district thickly studded with such trees, therefore, should be warmer in winter and less affected by summer drought than one practically treeless. To the dairy farmer, therefore, hedgerow trees should be more beneficial than harmful, although much may depend upon soil and climate and, to some extent, upon elevation. To the arable farmer, hedgerow trees are rarely of much benefit, except in the way of acting as general wind-breaks. They invariably cause the unequal ripening of crops by shading the ground, while their roots rob the soil round about them and cause a reduced yield. With fields of small acreage this may constitute a considerable loss, and it can hardly be said that the arable farmer has any great liking for hedgerow trees.

The value of hedgerow trees as producers of timber depends very much upon the species. Hedgerow timber in general is grown under two great disadvantages: 1st, its height-growth and the formation of long straight boles are checked and diminished by prevailing winds, and the absence of competition between individual trees; and, 2nd, the unrestricted development of side branches, which tends to produce coarse, knotty timber. These disadvantages are more or less common to all hedgerow trees, but they are very much greater with some species than

with others. An ideal hedgerow tree may be said to be one which is little affected by the prevailing wind, retains its leading shoot until late in life when grown alone, and has no great tendency to develop large side branches near the ground. Such a species is not easy to find. Sycamore and ash stand wind well, and are not characterised by low side branches, but they are both apt to lose their leading shoot early in life and develop a short bole. Another disadvantage connected with these trees is their tendency to exhaust the soil round about them, and to kill out or weaken a hedge in which they stand. Oak quickly loses its leading shoot, and forms a low spreading crown, and much the same may be said about Wych elm. Beech, of course, is out of the question, although occasionally met with in hedges, or, rather, where hedges ought to be. All of the above species, however, fail to produce timber of sufficient value to compensate the landowner for the loss of land taken up by them or the damage done to hedges and crops. If there be any difference, perhaps the sycamore is the best of them, as, if large and sound, it fetches a fair price in spite of knots, from 2s. to 3s. 6d. per foot being occasionally paid for large butts.

There is one species, however, which probably approaches the ideal more closely than any named above, and that is the English elm. The specific value of the timber is not high, but taking into consideration its tall, straight, and well-shaped bole, its comparatively small crown, and the rapidity of its growth, one is certainly justified in regarding this tree as worth its standing room. But probably the most valuable feature connected with the English elm is found in the fact that it propagates itself readily from suckers, so that a continuous succession of saplings are always coming on to take the place of felled or blown timber. This fact is seldom properly appreciated in hedgerow-timbered districts, and few realise the possibilities presented by this tree as a source of revenue when properly managed. Farms are frequently met with in the South and West of England which contain sufficient hedgerow timber to bring in an average annual sum which will keep buildings and fences in good repair and allow the landlord to derive full benefit from the rent. This, of course, would be impossible if the trees had not originated spontaneously, or were less fitted to produce

good timber at a rapid rate under the prevailing conditions. But, given the right soil, and associated with a suitable system of farming, it is not difficult to make out a good case in favour of hedgerow timber when consisting of the English elm.

As regards soil, the same principle applies in a general way to this tree as to any other species, and poor soils are not likely to bring about satisfactory results, either in the shape of landscape effect or commercial timber. In the South of England, however, there are few soils which are not sufficiently deep and good to produce timber of fair size, although neither poor, hard gravels nor stiff, wet clays are conducive to a rapid growth. Some of the best English elm timber is grown on the edge of the chalk districts, and in the combes and valleys which intersect the Downs. In most districts, however, at low or moderate elevations, trees containing 300 cubic feet of timber are frequently met with, although butts averaging 80 ft. or 100 ft. make as good a price as any.

The system of farming which can be best carried on in conjunction with the growing of hedgerow timber is undoubtedly dairy or sheep farming, to which the trees do least harm on the one hand and afford most benefit on the other. Grass, either in the form of pasture or hay, is not injured by the right class of hedgerow tree to any appreciable extent. If hay-making is rendered more difficult in a wet season by the presence of trees, some compensation is afforded in late springs or dry summers by the shelter and shade, which encourage an earlier growth in spring and retard evaporation of surface moisture in hot, dry weather. The shelter from strong cold winds or hot sun is always a valuable provision where cattle are fed, and this in itself may be said to justify the existence of trees.

The two most important points in the management of elm hedgerow timber are the selection or retention of suitable trees or saplings and the pruning off of low side branches at an early age. In selecting the saplings at each cutting or laying of the hedges only those with straight stems and well-defined leading shoots should be considered, and all others taken out whenever the opportunity occurs. Trees with crooked stems or of stunted growth, as well as any inclined to be flat-topped early in life, should be removed as soon as they exhibit these features,

or at the first periodic fall of timber which takes place, and only the best type of tree encouraged or allowed to grow to maturity. As soon as individual trees have reached a height of 30 ft. or so the pruning off of low side branches should begin, and be continued periodically until the boles are bare for at least 20 ft. from the ground, while all wide-spreading branches above that height should be shortened back. The branches removed from the bole should be sawn or cut neatly off close to the main stem, and if more than 3 in. in diameter should be dressed with coal tar, but with smaller branches the extra trouble and expense of dressing is rarely justified, unless the pruning and dressing are combined in one operation. But if pruned early enough, the pole-saw or pruning chisel will usually do all that is necessary, and at little expense. Neglected until the branches are large, however, pruning becomes a costly operation and one tending to blemish the timber. The system of pruning elms which prevails in the Home Counties, and consists of taking off all branches but a tuft on the top, is also objectionable, as it spoils the appearance of the trees and checks the growth of timber. It is said to have originated in the days when elm boles were largely used for water-pipes, to produce which pruning in this manner was a necessity. Judicious pruning both improves the quality of the timber and allows sufficient light to reach the ground below to enable an ordinary hedge to be maintained in health and vigour, although the most frequent complaint usually made against hedgerow timber is that it destroys the hedges. On poor ground, no doubt, hedges are seldom strong in any case, and any reduction of light or plant food tends to weaken them still more. But on good soils, and with timber and hedges managed in the right way, both will succeed on the same ground.

The chief point about the treatment of hedges under trees is the method of cutting. It will usually be found that when they are either allowed to grow rough for four or five years, and then cut hard back, or when cut and laid periodically, the hedges are maintained in better health and are more capable of resisting stock than when cut or trimmed annually. Annual cutting also prevents suckers from getting away, as they cannot be distinguished from hedge shoots, and are invariably cut off. But cut

as suggested above, both hedge and suckers have an equal chance, and one is not favoured at the expense of the other. Another aid towards preserving the vigour of a hedge lies in cutting the timber before it attains too great a size or age. From 80—120 years is quite old enough for elm timber when grown at a normal rate, and at that age it has not overshadowed a hedge long enough to affect its constitutional vitality, provided it has been treated on rational lines. Where hedgerow trees stand very thickly, however, it may sometimes happen that the hedge becomes entirely obliterated, but where this occurs the growth of the timber should make up for the expense of the fencing required.

Although the above remarks have been made with a decided bias towards the English elm for hedgerow trees, there is no reason why other species should not be grown if desired. But it must be remembered that the artificial planting of hedgerow trees cannot be considered a remunerative operation, or one likely to be undertaken from economic motives. On a large scale, therefore, the survival of this form of arboriculture must be confined to a species able to reproduce itself under more or less abnormal conditions, and one which, at the same time, possesses as few as possible of the objectionable features more or less peculiar to this class of tree, and that the English elm fulfils these conditions to a marked degree is evident.

A. C. FORBES.

CLEANLINESS IN DAIRY MANAGEMENT.

Milk is at once the most nourishing and the most delicate of all foods, nourishing because it supplies all the constituents necessary to support life, and delicate because in practice its character gradually changes from the moment it leaves the udder of the cow. These character changes are for the most part induced by micro-organisms ; and as cleanliness is the main factor by which the number and species of organisms may be kept under control, cleanliness in the handling of milk is of the utmost importance.

Milk as it exists in the udder is free from germ-life, but after reaching the milker's pail, it contains a considerable

number of those minute forms of life known as germs, bacteria, or microbes. If it were possible in ordinary practice to draw milk from the udder without exposing it to bacterial contamination, souring and other changes would not take place.

Of the organisms which get into milk it may be said that they belong to the smallest forms of plant-life, which find in milk a very suitable food and a medium in which they multiply rapidly, especially when it stands for a time in a warm place after being drawn from the cow. There are many species of these organisms, all of which are more or less distinguishable either by their form, habits of growth, or effects.

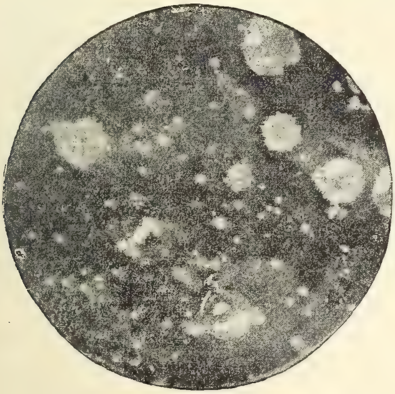


FIG. 1.—Photograph of a gelatine plate exposed for one minute in a badly ventilated cow-shed.

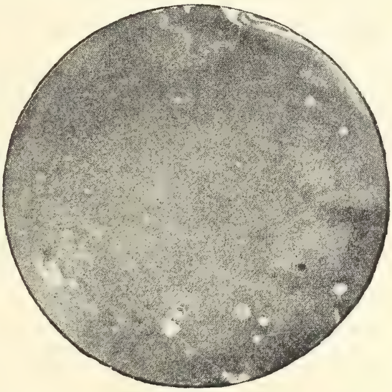


FIG. 2.—Photograph of a gelatine plate exposed for one minute in a well ventilated cow-shed.

During active life an organism absorbs food through its cell walls, and gives out a secretion or substance varying according to the species. The secretions of these organisms have a peculiar chemical action upon one or more of the constituents of the milk which may affect the whole. For example, a lactic ferment secretes a substance which acts on the milk-sugar, thereby producing lactic acid; this acid in turn acts on the casein, bringing about a state of coagulation. Another species secretes a substance which acts directly on the casein, rendering it viscid, and resulting in what is ordinarily known as ropy milk. The objectionable flavours that are from time to time found in milk, butter, or cheese, are also, as a rule, due to the particular bacterial life existing therein.

Sources of Bacterial Contamination.—Before dealing with the question of how bacterial contamination may be to some extent avoided, reference may be made to the chief sources of contamination, which are the cow, the milker, the air, and the utensils. The cow herself is one of the most fruitful sources; not that she secretes milk containing germs, but because these germs exist in the hair which covers her body, and many of them during milking find their way into the milk. The milker's hands and clothes, which in many cases are none too clean, are also sources of contamination. The atmosphere of a cow-byre, moreover, is in too many cases confined, and, consequently, impure; such an atmosphere contains a large number of bacteria, which, being slightly heavier than the air, gradually settle down, and some of these find their way into the milk or into the utensils waiting to receive it. Finally, the dairy utensils are frequently a great source of contamination, either owing to improper cleaning or because they are left after cleaning in places where they are exposed to infection.

The one great means by which the milk producer is able to minimise bacterial contamination is cleanliness. Just as a weed is defined as being a plant out of place, so may the weed of the dairy—dirt—be defined as being matter out of place. The injury caused by this dirt lies not so much in its direct action on the milk as in the fact that, almost without exception, it serves as a food on which bacteria can thrive and multiply, thereby greatly increasing the bacterial contamination of the milk. To put the matter in another light, "dead dirt" aids in producing "live dirt," which in turn acts upon the milk.

A badly kept and ill-ventilated cow-shed or byre serves to produce a germ-laden atmosphere to which the milk is exposed whilst it is being drawn, and too frequently also for a considerable time afterwards, owing to delay in removing it from the cow-shed to the dairy. Figures 1 and 2 illustrate this point. They are photographs of gelatine plates exposed to the air for one minute in badly ventilated and well ventilated cow-sheds, respectively. Fig. 2 shows that the number of organisms existing in the atmosphere of the shed are materially reduced by efficient ventilation.

A cow kept in such a byre is rarely clean in herself; her

exterior, especially her udder and hind-quarters, becomes more or less covered with dust and dirt, on which germs multiply, consequently increasing the number of organisms which fall into the milker's pail. This will be seen by reference to Figs. 3 and 4,

Next, the milker's hands and clothes, if not clean, are in the same way a fruitful, and at times a somewhat dangerous, source of infection ; and last, but not least, unclean dairy utensils may be the cause of rapid and unpleasant changes in milk, for an improperly cleaned dairy utensil is certain to contain microbes which will attack the milk the moment it is placed therein. (See Figs. 4 and 5.) In view of all this, it will be understood that

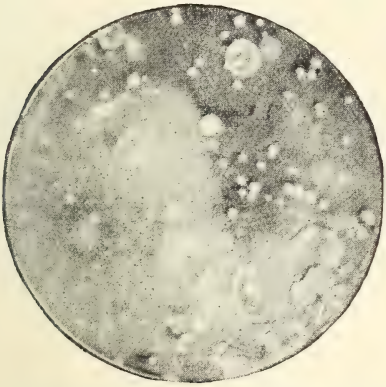


FIG. 3.—Gelatine plate exposed for one minute during milking under a dirty cow.

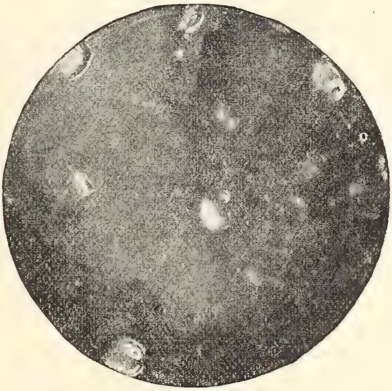


FIG. 4.—Gelatine plate exposed for one minute during milking under a clean cow.

a perfectly clean dairy and cow-shed must be to the microbe what a desert is to the human being.

Cleanliness in the management and housing of cows.— Efficient ventilation is, perhaps, the first essential to a good cow-shed or byre. Unfortunately, many of our present-day cow-sheds cannot be properly ventilated, owing to their faulty construction and insufficient air space. A properly ventilated cow-shed is one in which fresh air is constantly supplied without causing a draught, and without allowing the temperature of the shed to fall below 58 deg. Fahr. There are various ways of providing such conditions, but it is essential that the shed should provide an air space per cow of not less than 600 cubic feet nor more than 850 cubic feet, for below the minimum limit efficient ventilation causes draught, and above the maximum the tempera-

ture is apt to fall too low. The walls, the beams, and rafters should be regularly swept down and frequently lime-washed; above all, cobwebs and dust should not be allowed to accumulate. The cow's bed must be at all times kept clean, and the manure and soiled bedding should be removed from the shed at least twice each day. Any manure adhering to the cow after she has been lying down should be at once removed. During the winter, when she passes most of her time in the shed, the cow should be brushed down each day. Where this is done the bacterial contamination of the milk is sensibly decreased, provided that this cleaning down does not take place when milking is actually in progress. The gangway and gutter behind the cows should always be kept clean, and it is important that they should be in their cleanest state at milking time. The material composing the floor of the gangway and gutter should be impervious to moisture, otherwise it may harbour organisms which, if carried into the milk, may be the cause of considerable trouble.

It is not desirable to confine the cows entirely in the sheds during the winter; they should be given at least an hour in the open each day, for few things are equal as disinfectants to daylight and exercise.

Cows should on no account be allowed to consume dusty fodder during the time milking is in progress. On dusty fodder, such as mouldy hay, millions of organisms exist, and the shaking of the fodder serves to impregnate the air of the shed with countless numbers of these small forms of life. The writer has on more than one occasion traced serious milk faults to such a source.

Too much attention cannot be given to the drinking water. It is to be regretted that in many cases the cows have access only to a stagnant pond, into which they must wade before sufficient depth is obtained to enable them to drink. Such a state of affairs is always bad and should be remedied at once. Stagnant water is certain to be crowded with bacterial life, so that, apart from the risk to the cow's health, the chance of milk faults or troubles is greatly increased by allowing the cows access to such a pond. There are many ways by which the bacterial life of a stagnant pond may find its way into milk, but probably the most common way is by means of the organisms

carried out of the water on the exterior of the cow. It is not an uncommon sight in hot summer weather to see cows standing in the pond which has to supply all their liquid requirements. On leaving the water they must carry away thousands of bacteria, which at milking time may fall into the milk. The evil of this will be realised when it is remembered that among the bacterial life of any pond may be found, almost without exception, many organisms capable of bringing about injurious changes in milk, butter, or cheese. The ideal watering-place is a running stream of pure water. Where no such stream exists every endeavour should be made to approach the ideal as

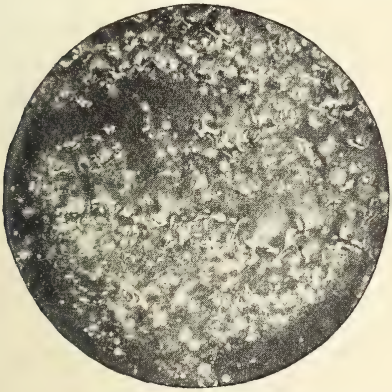


FIG. 5.—Plate culture made from milk drawn into a dirty pail.

FIG. 6.—Plate culture made from the same quantity of milk drawn into a clean pail.

nearly as possible, and if it is necessary for the cattle to drink water that is more or less stagnant, matters should be so arranged that they can obtain what they require without being able to stand in the water.

Importance of clean dairy utensils.—When milk is put into a receptacle it is of the utmost importance that the vessel should present a surface absolutely unabsorbent, otherwise it is impossible thoroughly to clean it. If, for example, warm milk is put into a dry wooden vessel, the heat of the milk causes the air in the wood to expand, and so drives out a portion of it ; and afterwards, as the milk and the vessel cool down, milk is sucked into the wood to replace the air previously expelled. When milk has once entered into wood it is a most difficult matter to remove all traces of it, the result being

that the portion which almost invariably remains acts as a food for germ-life. To obviate this, wooden milk vessels should always be thoroughly saturated before being used to receive milk by first placing them in hot, and afterwards in cold water.

With the majority of dairy utensils tin is the surface with which the milk comes in contact. Such utensils cannot be improved upon, provided that all joints are properly made and that all parts are readily accessible for cleaning. All dairy utensils should be cleaned immediately after use, and on no account should milk be allowed to dry upon them. The cleansing may be best accomplished by first washing them in cold or slightly warm water, afterwards in hot, and finally rinsing them in boiling water. If steam is available, and the vessels can be put over a steam jet, so much the better. The hotter the final rinsing or steaming, the greater the likelihood of all forms of germ-life being killed. After cleansing, milk vessels should be left in an airy position with the mouth or opening turned downwards, but in such a manner that the air has unrestricted access.

The evil caused by improper attention to the cleansing of dairy utensils may be attributed to the fact that while the vessel is not in use, bacteria are feeding and multiplying on the dirt left behind, so that milk placed in a dirty pail or vessel is at once exposed to many species of germ-life, some of which begin to work injurious changes.

Cleanliness in Milking.—In order to obtain the maximum amount of milk from a cow, it is necessary that the drawing should be accomplished quickly, quietly, thoroughly, and with as little disturbance to the cow as possible. Also, if the best is to be made of the milk after it has been drawn, it is necessary to observe the strictest cleanliness in connection with the operation.

At milking time everything should be at rest within the byre, that is to say, there should be no shaking of bedding or feeding of the cows going on. Shortly before milking begins a man or a boy should be sent with a brush and a clean cloth to brush and wipe each cow's udder. If any cow's udder is found to be soiled in such a manner that it cannot be cleaned with a brush and a cloth it should be washed; but too frequent washing is not

to be recommended, for if such takes place the cow is apt to get cold in one or more of the quarters.

Each milker should thoroughly wash his or her hands and arms before commencing to milk, and particular care should be taken to see that the milkers' clothes are clean and suitable to the purpose. This may be best assured by compelling each one to wear a smock which has not been too long absent from the wash-tub.

As soon as the milk of each cow has been drawn, it should be passed through a strainer, consisting of muslin resting on a fine wire gauze, and removed to the dairy as quickly as possible. It is a great mistake to allow milk to stand about in the cow-shed, as is often done, for this only serves to inoculate it further with germ-life.

Milking with wet hands is an objectionable practice. A cow can be stripped of her milk quite as thoroughly and as quickly by dry-milking as by wet, once the milker has been broken of the habit of milking with wet hands. Apart from the fact that no dirt is so difficult to remove from milk as that which enters in a liquid or semi-liquid form, the act of wet-milking leaves the teats covered with a film of milk on which germ-life immediately begins to multiply, and as that film of milk dries the germs become more or less firmly attached to the teats, only to be removed and washed into the pail at the next milking. Moreover, the germ-life formed under these conditions is generally made up of those species which are capable of bringing about very objectionable changes in milk.

Importance of Cleanliness to the Milk Seller.—To the milk seller all forms of germ-life are objectionable, for if he wishes to retain his market it is necessary that he should produce milk which not only meets with the requirements of the standard of quality, but retains its freshness as long as possible. The keeping quality of milk is mainly determined by two factors: one, the amount of germ-life contained in it; and, secondly, the temperature at which it is kept. This latter factor is, in reality, only a part of the first, as the rapidity of the multiplication of germ-life is dependent on temperature. Where milk has to travel any distance it is the common practice before sending it

away to run it over a milk cooler in order to lower its temperature.

Milk at a low temperature will keep fresh longer, because low temperatures retard the action of those organisms which commonly find their way into it. Nevertheless, under equal conditions, milk heavily charged with bacterial life always changes its character more quickly than milk contaminated to a lesser extent.

Importance of cleanliness in butter and cheese making.—It is not going too far to say that cleanliness is absolutely essential to the successful making of butter and cheese. Unlike the milk seller, to whom all forms of bacterial life are objectionable, the maker of dairy produce has to depend on certain forms of germ-life to perform vital parts of the processes by which milk is transformed into butter or cheese. So much does the maker of dairy produce rely on bacterial action that the quality of the final product very much depends on how successfully the desired germs have been encouraged and the injurious germs discouraged. Experience has taught us that wherever uncleanliness exists there also exists a large number of germs which, by their action, are almost certain to prevent the successful manufacture of dairy produce. Uncleanliness, therefore, increases the risk of the milk or cream becoming inoculated with those forms of germ-life which are capable of detracting from the quality of the cheese or butter finally produced. Thus it not infrequently happens that, owing to the uncleanly management of the cows, uncleanly milking, or uncleanly utensils, the possibility of making the finest butter or cheese has been destroyed before the milk has even reached the dairy.

J. F. BLACKSHAW.

HINTS ON WATER SUPPLY.

As a consequence of the remarkable succession of dry winters many rural districts are at the present time experiencing a shortage of water, and it is to be feared that, as the season advances, this condition will be greatly aggravated unless the next few weeks prove to be very much wetter than is usual for this period of the year.

It may be that in some districts which can yet depend upon good supplies, the effects of the scanty rainfall during the months which have passed may not be felt until later in the year; but it is important to remember that the degree of infiltration of all the rain which usually falls during the summer months is so trifling as to be almost negligible as a means of replenishment of springs and streams and well-sources.

To appreciate the physical conditions which govern the provision of subterranean supplies, it is important to remember that during the period of greatest rainfall, say from October to March, the needs of vegetation and the evaporating power of the sun are far less than during the remainder of the year, when these two factors are usually sufficient to account for nearly all the rain which falls during the drier period. It is, therefore, upon the autumn and winter rains that we have to depend for the maintenance of the supplies contained in the saturable "rocks," or in the fissures of "rocks," the substance of which is less permeable.

Broadly stated, a "land spring" is the overflow of an underground water-bed, which may be compared to a dish filled up with water-saturated earth. So long as the "level of saturation" is maintained ever so slightly above the edge of the dish, water will escape; but unless that level be maintained by additions from the surface, the overflow must cease and the spring fail. This comparison is not, perhaps, scientifically exact, but it may suffice to show that when a spring either yields a diminished flow or fails altogether, the supply may often either be increased or restored by lowering the level of the overflow, or—to pursue the illustration,—by chipping a piece out of the edge of the dish. This can be done, where the nature of the soil permits, by digging a trench to the necessary depth below the point where the spring bursts out. Perhaps only a foot or two of digging may suffice to restore the flow; but if, after a depth of, say, 10 ft. or 12 ft. below that point has been reached, the result is not satisfactory, advice should be taken as to the practicability of a well at some distance *above* the spring-point, that is to say, nearer to the centre of the dish.

A trench of more than 30 in. in depth should be formed with its sides sloping outwards, in order that they may be prevented from

falling in, owing to the saturation of the earth near the bottom. If the trench goes down to more than 5 ft. in depth it may be advisable, especially in loose earths, to provide wood sheeting and cross struts to preserve the sides.

In cases where springs or streams are depended upon for supplies, gauges should be fitted at a little distance below the spring-point; by this means the volume of water coming over the gauge can at any time be ascertained. The simplest form of gauge for small streams is the V-notch, which is formed by fixing together, exactly at right angles, two feather-edged boards, which are then set upright in the form of the letter V, in the course of the stream, in such a way as to completely dam it, so that all the water which comes down must fall over the V. The feather-edge of the boards is to form the inside of the notch. Then, on the up-stream side of the V, a peg, upon which has been cut or painted inches and their halves and quarters, is carefully driven in close to the edge of the stream, so that the zero mark on the peg is on precisely the same level as the bottom of the opening in the V. The approximate volume of water in gallons per minute for the various depths up to 5 in can then be seen by reference to the following table:—

Depth of water in inches above bottom of V-notch.	Fractions of an inch.				
	0.	$\frac{1}{4}$.	$\frac{1}{2}$.	$\frac{3}{4}$.	
1	2	$3\frac{1}{4}$	$5\frac{1}{4}$	$7\frac{3}{4}$	Gallons per minute coming through the gauge.
2	$10\frac{3}{4}$	$14\frac{1}{4}$	$18\frac{3}{4}$	24	
3	$29\frac{1}{2}$	36	$43\frac{1}{2}$	52	
4	61	71	$81\frac{3}{4}$	94	
5	103	—	—	—	

Thus, supposing the gauge to have been properly constructed and that the water at the first gauging stands at $4\frac{1}{2}$ in. up the peg, it indicates a flow of $81\frac{3}{4}$ gallons per minute. If, at a subsequent gauging, the water stands at $3\frac{1}{2}$ in. up the peg, it shows the flow to have diminished to $43\frac{1}{2}$ gallons, or a diminution of $38\frac{1}{4}$ gallons per minute since the former gauging.

Where water from a spring or stream is required to be delivered at a distance, by other than hand or animal traction, the hydraulic ram will in most cases be found to meet all requirements. This useful little machine is, in effect, a self-

contained, hydraulic pumping-engine, which, once set in motion, needs little or no attention. It should be set up in a specially built brick pit, near to the stream that is to feed it, and at such a level below the bed of the stream, as will give to the drive pipe a fall or "head" from the stream to the ram, of at least 2 ft.; the greater the head the greater will be the efficiency of the ram, but with a fall of even 2 ft. water can be lifted to any reasonable height in any direction through iron or flexible pipes.

It is important to observe that surface streams are always liable to pollution or fouling, from one cause or another, and that unless the water is taken direct from the source, and that source carefully guarded against contamination, the water should be filtered or otherwise purified before use for domestic purposes. Boiling is to be recommended, but as this is inconvenient where large quantities are used, filtration by the readiest means at hand has often to suffice. A very good filter can be made of any suitable receptacle, such as a tank or water-butt, on the bottom of which should be laid fairly large pebbles or broken stones to a depth of 6 in., then, over this, a 6-in. layer of coarse gravel; over this, 9 in. of fine gravel, and finally a layer of clean sharp sand to a depth of 10 or 12 in. A top layer of about 3 in. of fresh sand added from time to time will keep the filter in good working order throughout the season: but it should be thoroughly cleansed and fresh material provided at least once a year. The water for use should be run off from the bottom of the filter by means of a draw tap or syphon into another vessel kept for service purposes.

Rain-water catchment as a means of supply should in no case be neglected. Proper means of arresting the rain which may fall upon the roofs of farm buildings and houses, may, during the present season, mean all the difference between some water and no water. First of all, the rain-water gutters and stack-pipe hoppers should be thoroughly cleansed, and any defects repaired. Two tanks should be provided; one, having a rain-water separator to take off the first rush of dirty roof water, being fitted as a filter as above described, with an overflow into the second and much larger tank, which should be placed at a lower level. The second, or service tank, can

hardly be too large. It should really have a capacity equal to one-fourth of the annual rainfall, estimated with reference to the available roof area. Thus, assuming that the mean annual rainfall of the district is 24 in. (2 ft.), and that the area of the roofs to be "tapped" is 1,000 sq. ft., the service tank should be capable of holding $\frac{1{,}000 \times 2}{4} =$ 500 cub. ft., or (at $6\frac{1}{4}$ gallons per cub. ft.) 3,125, or, say, 3,200 gallons.

House tanks and water-butts should be placed in situations where they will be protected against north-easterly winds in the winter and, if possible, against the direct rays of the sun in the summer. It is, perhaps, best to construct the service tank below ground, of brickwork set in cement and rendered inside with neat cement, and to protect it by means of a stout wooden cover fitted with a ventilating pipe and a flap-lifting manhole cover; but if a galvanised iron surface tank is used, it, too, should be covered in and ventilated, and during the hot weather limewhited on the outside so as to minimise the absorption of heat.

Existing wells should be gauged from week to week in order that the available supply, at the known rate of consumption, may be ascertained. This can be done by using a weighted cord, which is carefully lowered until water level is reached (indicated by the sound of the weight striking the water), when a knot is tied in the cord, which is then further lowered until its sudden slackening indicates that the bottom of the well has been reached; another knot is then tied and the cord withdrawn. The distance between the two knots gives the depth of water in the well.

A ready rule for arriving approximately at the number of gallons per foot of water in the well, is to square the diameter of the well, in inches, cut off one figure, and divide by 3. Thus: If the well is 60 in. in diameter, 60 × 60 = 3,600; cut off one figure = 360. This, divided by 3 gives 120, which is the number of gallons for each foot of depth. If, therefore, the depth of water were found to be 10 ft., the available supply in the well would be 1,200 gallons. As the bottom diameter of a well is sometimes less than the top diameter, care must be taken, in ascertaining the volume, as above, to adopt, for the purpose of calculation, the diameter of the part where the water is: A lighted candle

lowered down the well will serve to show any breaks of diameter above water-level.

Lowering wells, either by digging or boring, is often effective as a means of increasing the supply, and in some cases it is desirable to drive headings or tunnels from the sides of the well into the surrounding "rock" so as to tap fresh water-sources; but before any measure of this kind is decided upon, it is advisable to have the best advice, as otherwise much disappointment and needless expense may be entailed. Especially is this caution to be urged when a new well is to be sunk. Water may perhaps be "found" by a person having no geological or other scientific knowledge, but it may—as is known to have happened in more than one case—be quite unfit for domestic use when found.

After the site of a new well has (on the best advice) been selected, a trial boring should be made, and any water brought up should be submitted for analysis by a qualified analytical chemist before the work is proceeded with. Wells should, if possible, be not less than fifty yards away from any cesspit or thirty from where animal droppings can be washed into the soil—the further away the better—and every well should be steined up to at least six courses above ground and protected with an oak or stone cover, so as to exclude surface impurities. Galvanised iron buckets and chains should in all cases be used in preference to wooden buckets and hemp ropes. Windlasses should be fitted with ratchet and pawl gear, so that accidents due to the running down of a full bucket may be avoided.

Above all, the well should be as deep as the water-bearing stratum and money will allow.

Agricultural Credit in France.*

The co-operative systems of agricultural credit which have been so markedly successful in Germany and some other European countries are more usually advantageous to the small than to the large farmer, though where the operations of societies are on a sufficient scale even substantial sums of money can be borrowed on favourable

* See article on "Agricultural Credit Banks," May, 1905, p. 96.

terms. In general, however, it is the farmer in a small way whose resources are limited and who is farming on an insufficient capital, to whom a temporary loan for the purchase of cattle, fertilisers, or seeds may be of invaluable assistance. It frequently happens that an immediate want of money necessitates the sale of crops at unfavourable prices or of stock in an unfinished condition, whereas a loan easily obtained would enable the cultivator to postpone the sale till a more suitable occasion.

Though essentially a country of small holders, it was not until recent years that agricultural banks began to be introduced into France, and according to a Report* by the Ministry of Agriculture, there exists in many districts a reluctance to adopt any system of credit. Attempts to establish a bank are often met with the observation: "There are only two classes of farmer in our district: the well-to-do who would never borrow, and the needy who would never repay." When a society is formed, however, the better-off find it both profitable and convenient to have resource to a co-operative bank, while among the other class the Report observes that those who are unable to pay their debts are much more rare than might be supposed. The Ministry of Agriculture gives several examples of the advantages accruing from the existence of a co-operative bank, of which the following may, perhaps, be quoted:—"A farmer had to pay a sum of £60 in November, 1902, and he had for sale 500 bushels of wheat, which was then very low in price. By applying to the local co-operative institution he received an advance repayable in three months. He sold his wheat in December, when it had risen about 3d. per bushel, thus receiving about £6 more than would have been the case in October. The bank charge was 14s., so that he made a net gain of over £5."

The earliest attempt at the establishment of a co-operative credit bank was made in 1884, when a society was formed at Poligny with a capital of £800, of which one-half was paid up. Notwithstanding its small capital, this society was very successful, but its example was followed in only a very few instances. In 1893, rural banks (*caisses rurales*) on the Raiffeisen system began to be introduced, and in 1901 there were 543 of these

* *Bulletin Mensuel*, Dec., 1904.

associations federated in a central society (*Union des caisses rurales*).* Based on the principle of the unlimited liability of the members for the debts of the society, it is found that bankers will grant advances to societies of this kind without any other guarantee, so that no capital is required. The safety of the money lent to members is ensured by confining each society within very small limits, usually a parish, where the circumstances and character of the members are easily known. Particulars were not available for the whole of the above societies, but it appears that 345 societies had a membership of 10,682, or about thirty-one persons each, and the loans in 1901 numbered 4,319, of a value of about £100,000: that is, each society granted about twelve loans in the course of the year of about £24 each.

Another form of society, known as agricultural banks (*caisses agricoles*), exists, based on the unlimited liability of members, but with a variable capital, each member subscribing for one share, which may be paid for by monthly instalments. These societies are combined in the *Centre fédératif du Crédit populaire*, which in 1902 embraced 340 societies, with a membership of 11,326, and a capital of £86,000.

In order to encourage the development of agricultural credit a law was passed in March, 1899, which provides for advances from State funds, free of interest, to district or regional banks (*caisses regionales*). These banks are unions or federations of local banks, and they devote themselves exclusively to making advances to their affiliated banks, their capital being derived from the State grants and from shares subscribed by the local banks. The total sum available for this purpose was £1,600,000, with an annual addition of not less than £80,000. The advances are now regulated by a Committee, according to a Decree dated 11th April, 1905.

As a result of this law there existed at the end of 1903 forty-one district banks to which the State had advanced about £350,000, and the paid-up capital of which was £123,000. The local co-operative banks affiliated to them numbered 616, with a paid-up capital of about £59,000. The loans granted in the course of the year amounted to £900,000. By the beginning

* *Annaire de l'Agriculture*, 1904.

of 1905 the advances by the State had increased to £644,000. The growth of these banks during three years will be seen from the following table:—

Year.	District Banks.	Affiliated Local Banks. No.	Members.	Loans Granted. £
1901	21	300	7,998	217,000
1902	37	456	22,476	572,000
1903	41	616	28,204	900,000

There is considerable variation in the constitution of these local societies, very few restrictions being made by law on the form a local society must take, but the system favoured by the Department of Agriculture is based, not on the Raiffeisen principle of unlimited liability, but on co-operation with limited liability, the subscriptions of persons interested, together with the assistance afforded by the State, enabling loans to be made by the district bank either directly out of the capital or by re-discounting bills through the Bank of France. The following is a summary of the scheme recommended by the Department.

The members of a local co-operative bank must be drawn from the members of an agricultural association, but the number required for its foundation need not exceed seven. It is not, indeed, desired that these local banks should embrace a large number of members, as it is important that the character and financial condition of each should be well known. They therefore usually confine their operations to one parish, but are affiliated to a district bank, which may include the whole of a department. Each of the members must subscribe for one share, varying from 16s. to 32s., but only one-fourth need be paid up; this bears interest at a rate fixed annually. The liability of the members is limited to the amount of their shares, and a reserve fund is formed by devoting to that purpose three-fourths of the annual profit.

In making application for a loan a member must describe the purpose to which it is to be applied, and state the security offered; if the committee grant the loan, the borrower signs a bill which is forwarded for discounting to the district bank, by whom the money is transmitted to the local bank. Loans can thus be obtained in two or three days. Bills are made for three or six months, renewable after payment of an instalment. If the borrower is well known and of good standing, his sig-

nature alone may be accepted; otherwise, or in the case of considerable amounts, security, either personal or on stock, is required. A control over the loans is also exercised by the district bank, which keeps itself informed as to the standing of the members of its local banks; when necessary, it may ask for special guarantees.

According to another system, the local banks keep a small sum in hand in order to grant loans without delay, and, when necessary, discounts its bills at the district bank. The total sum thus kept in hand by all the local banks affiliated to one district bank may amount to a considerable sum, and as it is not constantly used, part remains unproductive. This method is not therefore recommended, more especially as it is desirable that the organisers of small local banks should not be under the necessity of keeping complicated accounts. There are also other systems of establishing a local bank, *e.g.*, mixed liability, the members being liable for two, three, or four times their subscription, or like the older banks, that of unlimited liability.

The local bank devotes an important part of its resources to taking shares in a district bank; indeed, commonly, the whole amount subscribed by members is used in this way. The capital of a district bank, however, need not be very large; for instance, if it amounted to £2,000, that sum would enable it to obtain at the commencement an advance from the State of £4,000, which might afterwards be increased to £8,000, as the law permits the State to advance four times the paid-up capital. A portion of this sum would be devoted to the purchase of securities, to be deposited with the Bank of France and form a guarantee fund, the remainder of the capital being placed in a current account, and the bills for loans granted retained as far as possible, but re-discounted when necessary.

As an alternative, the district bank may invest practically the whole of its capital in securities and obtain advances by immediately re-discounting bills at the Bank of France. The charge made by the district banks for advances or for discounting bills varies from 1 to 4 per cent. Attention is drawn in the above-named Report to the inadvisability of granting loans at a rate below the ordinary bank charge. The advances made by the State are intended merely to facilitate the establishment of

co-operative banks, and although, owing to these advances being free of interest, the banks are able to lend money at a very low rate, it is pointed out that they are misleading agriculturists as to the rate at which they may reasonably expect to borrow, and that the banks are unable profitably to extend their operations, as they can only borrow at a higher rate than they are charging to their members. The Department therefore urges these co-operative banks to place their business on a sound commercial footing by only discounting bills at a rate not less than that charged by the Bank of France, and to endeavour to make a profit on their transactions which will enable them to place an annually increasing sum in reserve.

Further information as to the working of co-operative credit in France is to be found in an article by M. Edmond Rabaté in the *Bulletin Mensuel* for March, 1905, published by the French Ministry of Agriculture.

Village Banks in England.

The Village Co-operative Credit Societies in England, to which reference was made in the preceding issue of this *Journal*, (p. 100) are now nine in number. Their object is to enable small farmers, market gardeners, or allotment holders to obtain advances for reproductive purposes at a low rate of interest. Loans are granted, for instance, for the purchase of cows, sheep, and pigs ; the paying of working expenses on small holdings and allotments ; the repair of tomato and cucumber houses, and the purchase of seeds and manure. The rate of interest charged varies, but does not exceed 6 per cent. per annum, or 1s. per month on £10. The working capital is provided by entrance fees and by deposits, supplemented when necessary by loans from a joint stock bank. The security offered is the unlimited liability of all the members, and it is on this security that advances are obtained from bankers. In the limited areas in which these societies work an intimate acquaintance with the circumstances of each of the members is not difficult of attainment, and as borrowers are required to furnish one or two sureties, losses are practically unknown.

The societies in existence at the present time are situated in Lincolnshire at Scawby, Spalding, and Friskney; in Hampshire at Hedge End; in Norfolk at Wiggenhall; in Worcestershire at Castle Morton and Far Forest; in Leicestershire at Freeby; and in Bedfordshire at Clophill.

The Scawby Society was established in 1894, and during the first ten years of its existence lent out £1,032 in thirty-eight loans. In 1904 the number of members was twenty-nine and the deposits £90, while the loans granted in the year amounted to £270. It also had a reserve fund of £35.

The Wiggenhall Society, in Norfolk, numbered forty-five members in 1904, and granted ten loans amounting to £125 in that year. Loans have been granted for the purchase of seeds, horses, pigs, and sheep; hire of horse labour for small holdings and allotments; and improving greenhouses. In every case the loans have been punctually repaid.

The Friskney Society, in Lincolnshire, was only established during the past year, but it made, up to December last, three loans amounting to £50. One of these was for the purpose of helping a small holder to take a larger holding, one for purchasing extra stock, and one for purchasing seed potatoes. The deposits received amounted to £82, and in January, 1905, further deposits of £39 were received, and loans to the amount of £65 were advanced.

Another society, started in 1904, is that at Spalding, which has 110 members. One loan was granted for the purchase of a horse and a cow, the borrower being the occupier of thirteen acres of land.

The Hedge End Society, in Hampshire, seems to be doing a useful work. The number of members is thirty-three, and the loans in 1904 amounted to £205. The secretary of the society states that the loans were granted for the purpose of purchasing manure and seeds, and also for the hire of labour. One member was able to buy two or three acres of potatoes, which he sold at a profit, and others have increased their holdings through the loans. All the loans have been punctually repaid.

From these examples it will be seen that the extent of the operations of these co-operative banks is at present quite small, but where they are established they no doubt serve a useful

purpose in assisting the small cultivator and village labourer, who are frequently hampered by the want of sufficient capital. All the societies are affiliated with the Agricultural Organisation Society, Dacre House, Dacre Street, Westminster, S.W., from whom particulars as to the method of starting such a society can be obtained.

Experiments in the Improvement of Wheat.

The Home-Grown Wheat Committee of the National Association of British and Irish Millers, which was appointed in 1902 for the purpose of studying the question of quality in home-grown wheat, has been conducting experiments with home and foreign varieties and the effect of crossing and manuring, with a view to the production of a class of wheat which could be cultivated in this country and which would approach in "strength" the hard wheats of North-West America, Southern Russia, Roumania, Hungary, and elsewhere. "Strength," or the capacity to make a large loaf, is an element which is comparatively deficient in English wheat, and is the main factor in causing even the best grain to fetch a distinctly lower price than the best qualities of wheat from Manitoba, Kansas, or Russia. This, it may be remembered, was explained and illustrated by photographs in a previous article,* which gave an account of an enquiry conducted into the chemical qualities of various flours, with the object, if possible, of determining the cause of strength in wheat.

At a meeting of the Association in April last, Mr. Humphries, on behalf of the Committee, gave particulars of their work during the past year, a summary of which is given below.

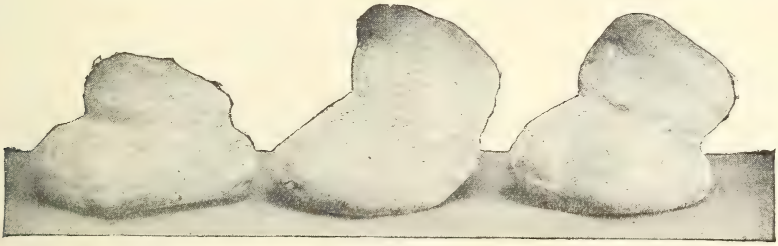
Mr. Humphries pointed out that the wheats grown last year were no stronger, perhaps not quite so strong, as the samples that were fit to mill in the previous year. Having regard to the extraordinary rainfall in 1903 and the unusual amount of sunshine in 1904, it is obvious that the amount of summer

* *Journal*, Vol. IX., Sept., 1904, p. 321.

rainfall and the amount of sunshine are not determining factors in the production of strength.

The effect of autumn *versus* spring sowing has been further investigated, and the results of the two years' work on this subject show that the time occupied from earing to cutting is not a cause nor an index of strength.

The effect of manuring has been carefully tested, and affords ample confirmation of the facts previously disclosed, that long-continued applications of nitrogenous manures in heavy dressings do actually send up the total percentage of nitrogen



No. 3. No. 1. No. 2.

Nos. 1 and 2. Improved "Red Fife." Third year grown in England, raised from seed originally supplied by Dr. Saunders, Director of the Government Experimental Station, Ottawa. No. 3, "Golden Drop" (very fine sample). Nos. 1 and 3 were grown side by side on the same farm at Faversham. No. 2 was grown at Cambridge.

and dry gluten, but the baking value of flours from wheat so treated is greatly deteriorated.

The Committee do not make any definite pronouncement as to what is the cause of strength, but they regard breed as an extremely important, if not predominant, factor. It has been found that bad land, which in previous tests yielded poor quality wheat when ordinary English wheats were grown, yield first-class results as to strength with other sorts of wheat. Another point is that although most foreign wheats degenerate when grown in England, there are exceptions. Among some hundreds of Russian samples sown, only four have been selected as worth investigating further. Three of these are in their fourth year. Tests have also been made with Hungarian and Canadian varieties. The results obtained from one of the latter—Fife wheat—appear of importance. It was grown at Wye College in 1902, at six centres in 1903, and at three places in 1904. A very interesting result was obtained by a farmer who obtained some Fife seed from Wye College and planted

it on a measured area adjoining a similar area sown with his ordinary crop, viz., Golden Drop. Of the latter he obtained $41\frac{1}{2}$ bushels per acre, and of the Fife $43\frac{3}{4}$ bushels per acre. Still more important is the fact that whereas in the bake-house Golden Drop earned 56 for strength, Fife, as an average of several trials, earned 86. Two loaves of bread, one made from Golden Drop, the other from Fife, are shown in the illustration, as well as a third loaf, raised from the same stock at Cambridge. Mr. Humphries observed that "both flours have been treated quite fairly; the Fife has to be treated somewhat differently to the other, for whereas the Golden Drop, although an exceedingly fine lot, is simply English wheat, giving us what I may call stodgy doughs, the Fife is a different article altogether, giving doughs of the tough elastic nature characteristic of flours made from American wheat." The crop of this wheat grown last year on the farm in question was sold at a high price, and this year forty acres of Fife wheat have been sown. It is also being grown in quantity at a number of other places. The result obtained from this wheat is regarded as of the highest importance, as the first object of the enquiry is to find wheats which, even if they fail in other respects, maintain their strength in this country. These could then be used for crossing with a view to the fixing of other desirable qualities. In order to avoid delay, the Committee are crossing together all the varieties of any promise as far as strength goes with a number of the best English varieties, and also with a few new ones which have good yielding and good straw characteristics.

Manurial Requirements of Swedes.

An account was given in this *Journal* for July, 1904 (p. 219), of a series of experiments which were being conducted by the Agricultural Department of the Reading College to investigate the manurial requirements of swedes. The results of the operations of another year are now available, but it is proposed to continue the trials for several more seasons. The amount of manure applied to each plot, the cost and the

average increase per acre in each year, are shown in the following table. The experiments were carried out on thirteen farms in 1904, and on twenty-six farms in 1903 :—

No. of Plot.	Amount of Manure per acre.			Cost per acre.	Average increase per acre.	
	Sulphate of Ammonia.	Super-phosphate.	Sulphate of Potash.		1903.	1904.
	lb.	lb.	lb.	s. d.	Tons.	Tons.
1 and 5 (no manure)	—	—	—	—	—	—
2.	51	250	40	16 9	2·9	4·2
3.	102	500	80	33 6	4·8	6·5
4.	204	1,000	160	67 0	7·1	9·8
6.	—	500	80	22 0	4·0	5·0
7.	102	—	80	18 6	1·9	·8
8.	102	500	—	26 6	5·2	4·4

The results obtained in both years show that on the majority of soils it is not possible to obtain remunerative yields of swedes without the addition of phosphatic manures. There are, however, soils here and there in chalk districts which do not respond very much to phosphatic manures. In these experiments the omission of potash diminished the yield of roots in four cases only. This was found to be the case more especially on the stiffish red soils with flints overlying the upper chalk. The average yield of the unmanured plots was 13⅓ tons per acre.

One of the most striking visible results was the influence which the amount of manure had on the regularity of the crop. Where the plots were unmanured there were large numbers of gaps in the rows, whereas missed plants were rare on the heavily-manured areas. There is no doubt that the presence of easily available manure close to the germinating seed or young plant assists the plant to become established. Moreover, the plants on the unmanured plots were invariably very much more attacked by gall-weevil than those on the manured plots.

Experiments on the manuring of swedes and turnips were also conducted by the Armstrong College at six centres in the county of Durham. Here also phosphates were found generally to be of the greatest importance, though on certain soils nitro-

gen and potash proved to be equally or even more necessary, so that where swedes are to be manured with artificials only it is considered safer, as a rule, to apply a complete manure. Superphosphate gave, on the average, a slightly better crop than basic slag, but the latter, owing to its smaller cost, was more profitable, while a mixture of the two manures was still more so. Dung alone did not prove so profitable as artificials alone when the whole cost of the manure was charged against the crop, while the addition of artificials to farmyard manure resulted in a loss throughout.

Value of a Complete Manure for Hay.

In the manuring of hay more than of any other crop on the farm, the all but common practice is to apply an incomplete manure containing nitrogen alone in the form of nitrate of soda or sulphate of ammonia. The reason for this is to be found in the ready response of this crop to a dressing of nitrogen, and the consequent deduction that anything further added would mean so much waste. Experiments conducted in 1904 by the Edinburgh and East of Scotland College of Agriculture showed that the yield was in every case increased so much by the addition of phosphates and potash to the nitrogen as to more than repay the cost of the extra dressing, and in the Report by Mr. W. Allan, it is observed that even where this only is effected there can be no question as to the advisability of applying a complete manure. It has the great advantage of preventing the exhausting effects on the soil of nitrate of soda, for if phosphates and potash are not applied along with the nitrate these constituents are removed by the crop, thereby reducing by so much the fertility of the soil. Another important point is its bearing on the quality of the produce. The general manure produced a firmer and better developed plant, and, consequently, hay of better quality than that produced by nitrogen alone.

Importation of Grass Seeds into Argentina.

The Argentine Government have issued a Decree prohibiting the importation into that country of lucerne and other forage plant seed which, after being analysed by the Department of Agriculture, is found to contain more than fifty grains of dodder to the kilogramme (2·2 lb.). Requests for permission to import these seeds must be accompanied by a certificate from a competent scientific authority of the country of origin, legalized by the proper Argentine Consulate, certifying that the seed is free from, or does not contain more than the margin allowed of, dodder; but, notwithstanding this certificate, all seeds found on sampling to exceed the percentage named will be rejected.

Finger-and-Toe in Turnips.

A description of the disease known as Finger-and-Toe in turnips appeared in this *Journal* in September, 1902, and has since been reprinted as a leaflet, copies of which may be obtained on application. Experiments carried out by the Armstrong College, Newcastle-on-Tyne, during the past few years, tend to confirm the suggestions made therein, but it may be useful to reproduce here the conclusions arrived at as to the application of lime for the purpose of checking this disease:—It is considered that 2½ tons an acre of common lime, slaked to a fine powder and applied so that it is thoroughly mixed with the soil, is usually productive of good results. It is advantageous to apply it as soon after the removal of a diseased turnip crop as possible, but the soil must be fairly dry when this is done, and it must be thoroughly mixed with the surface soil. If it is applied to a wet soil, or is deeply buried, or is in a pasty condition, so that it will remain in even small lumps in the soil, and not be distributed thoroughly, it will have little or no effect. Lime may also be applied with about equal advantage to the hay stubble, and with good effects to the oat stubble, or even a few months before the turnips are sown, provided it can be thoroughly distributed throughout the surface soil. Heavier dressings of lime, up to 10 tons, are likely to be more effective, but not in proportion to their cost. So far as the results of the experiments go, lighter dressings either of

common lime, or of ground lime, are not so useful as is a dressing of 2½ tons of common lime. It should be noted also that the results obtained from certain plots show that lime may be even more effectual on the second than on the first turnip crop which follows its application. Lime probably does not check the disease to the greatest extent till many years afterwards. Judicious applications of heavier dressings of gas lime, where this is easily procured, may be very useful, and this is probably best applied to the hay stubble, on which it should be carefully spread and be exposed for at least two months before being ploughed in.

The Bean Beetle.

The Bean Beetle (*Bruchus rufimanus*) is similar in appearance and habits to the Pea Beetle (*B. pisi*), in regard to which a note appeared in this *Journal* for July, 1904 (p. 225).

As in the case of the pea beetle, its presence is harmful, because it interferes with and may prevent germination, while the consumption of the stores of food laid up for the use and proper development of the future plant frequently causes the resulting plants to be weakly.

Life History.—The beetles after pairing lay their eggs on the very young pods in the field. Out of the egg hatches a white, wrinkled grub, which bores into the nearest bean and nourishes itself till full grown on the reserve matter of the seed. When full grown the grub becomes a pupa inside the bean, and in the spring (sometimes earlier) the beetles emerge. The round hole shows the place of emergence ; in beans that still contain the beetle a little round patch on the skin or coat of the bean marks the place where the beetle lies.

Remedial Measures.—1. Nothing can be done against this beetle in the fields, but beans containing the beetle should not be sown, as the insects will issue, pair, and lay on the new crop. Those that have emerged before sowing fly to the plants for their egg laying.

2. If the beans are placed in a closed jar, the beetles will come out and die without harming the seeds further. The beans can then be sown in the next season, but those with

several holes are likely to give poor plants and some may give none.

3. If, however, it is wished to plant the beans without keeping them the beetles can easily be killed by the following means :—Place the beans to be treated in an *air-tight* receptacle or box. Pour some bisulphide of carbon in a saucer, and lay the saucer on the top of the beans and close the box, keeping it closed for twenty-four or forty-eight hours. The fumes of the bisulphide of carbon, which are heavier than air and very poisonous, will kill all the beetles. One ounce of bisulphide of carbon would do for 40 cubic feet of space, or 1 oz. for every 100 lb. of seed. The operator must not bring a naked light near the bisulphide of carbon and he must be careful not to breathe the fumes.

Destruction of Insects by Starlings.

Starlings almost invariably utilise holes for breeding, and they have, both in Belgium and Germany, been long supplied with artificial nesting-boxes where natural nesting-places are not available. A box 10 to 12 inches in depth and 6 inches by 6 inches in cross section, with a sloping and slightly overhanging roof, and a hole 2 to $2\frac{1}{4}$ inches in diameter near the top, with a perch below, is commonly used for this purpose. Some years ago, in a large and richly stocked nursery in Belgium, chafer beetles became so numerous as to be a very serious infestation. After trying by all known means to eradicate them, the proprietor observed that starlings devoured large numbers both of the larvæ and the mature insects. Taking a lesson from this, he erected about half a dozen nesting boxes on 15 feet poles, and as they were immediately occupied by the birds he continued to provide boxes until 125 were in use. The result was that the chafer infestation grew gradually less and was finally completely overcome.

Importation of Insect Pests into the United States.

A law prohibiting the importation or transportation of insect pests was approved by Congress on March 3rd, 1905. It is to the effect that no one shall transport from one State to another, or from a foreign country into the United States, the gypsy moth, brown-tail moth, leopard moth, plum curculio, hop plant louse, boll weevil, or other insect in a live state

which is notoriously injurious to cultivated crops, forest or other trees, or the eggs, pupæ, or larvæ of any such insect. The transmission of insect pests by post is strictly prohibited. Special regulations will be made for the transmission of insects for scientific purposes.

Trap Lanterns or Insect Catchers.

Dr. W. Remer describes in the *Jahresbericht der Schles. Gesellschaft für vaterl. Kultur*, 1904, his experiments with traps for catching noxious insects injurious to farm and fruit crops. Such insect traps have been recommended on the Continent as a means of combating insect pests. The results of recent investigation, however, tend to disprove their usefulness. In 1902 Dr. Remer chose a trap lantern of the cheapest make, in order to test their efficiency, and to ascertain the cost of using them. Round an ordinary paraffin lamp a tank filled with sugar-water was fixed, but the insects caught were in too bad a state of preservation to enable them to be identified. A lamp with a reflector was then used, and the tank filled with cyanide of potassium instead of a liquid solution. The only advantage from this alteration was in the better preservation of the insects caught. The experiments showed that a considerable waste of time as well as expense was involved, and the "catch" was most unsatisfactory, consisting for the most part of indifferent insects, the remainder being useful ones, whilst not a single noxious insect was obtained. Before starting on the experiment the presence of plenty of noxious insects in the neighbourhood was ascertained. Slingerland, in "Trap Lanterns or Moth Catchers" ("Cornell Univ. Agric. Exp. Stat. Bull., 1902,") refers to experiments undertaken in 1889 and 1892, with the result that 77 per cent. indifferent, 12·6 per cent. noxious, and 10·4 per cent. useful insects were caught. Even here the advantage of the trap was outweighed by the cost of using the apparatus and by the nearly equal proportion of useful insects caught. Much more unsatisfactory are the records of Ribage (*Boll. di. Entom. agrar. e Patol. vegetale, Padova,* 1904), who experimented during

six nights with three acetylene lamps and caught not a single noxious insect. Dr. Remer, in conclusion, states that these traps are practically useless, as any advantage they may possess is more than counterbalanced by the disadvantages.

Live Stock Import Regulations :— New Zealand. *

Under the provisions of the New Zealand Stock Act, 1893, horses, cattle, sheep, and swine may be imported into New Zealand from the United Kingdom subject to regulations of which a summary is given below.

The introduction into New Zealand of any stock infected or likely to be infected with any disease is prohibited. All cattle, sheep, and swine intended to be imported into the Colony must be shipped at the ports of London or Glasgow, and be landed at the ports of Auckland, Wellington, or Lyttleton.

Not less than fourteen days' notice in writing shall be given to the Inspector of Stock stating the number, sex, breed, and colour of the animals, the vessel and port of shipment, and the date of expected arrival. The exporter of the stock shall also make a declaration before a Justice of the Peace, solicitor, or public notary, to the effect that they are free from all infectious and contagious diseases, and have not within six months been in direct or indirect contact with infected stock, and this declaration shall be endorsed by a veterinary surgeon in the district in which such stock are, stating that he has examined the stock referred to and has no reason to doubt the correctness of the declaration in any particular. This declaration must be delivered to the veterinary surgeon inspecting such stock at the port of shipment, and all stock, prior to their being put on board any vessel to be shipped for the Colony, shall be carefully inspected at the owner's expense by the authorised veterinary surgeon. If the veterinary surgeon aforesaid shall be satisfied that the whole of the stock put on board or to be put on board such vessel are free from infection, he shall deliver a declaration

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* Live stock import regulations have been published in this *Journal* for the following countries :—United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; and Germany, May, 1905

to that effect to the master of the vessel, together with the declaration and certificate already mentioned. If any stock arrive unaccompanied by the required declaration and certificate, the owner shall pay a fine of 20s. per head, and the term of quarantine shall be extended for such further period as the Minister may direct.

On arrival in the Colony, stock shall be examined by a veterinary surgeon and an Inspector, and if found to be infected with any disease they shall be destroyed or otherwise disposed of as the Minister or Chief Inspector of Stock shall direct.

All foreign stock found on inspection to be free from infection shall be conveyed (in conformity with certain directions) by water at the owner's risk and expense to the quarantine-ground, and shall remain in quarantine as follows:—Horses, fourteen days; cattle, sheep, goats, &c., sixty days; pigs, sixty days; and dogs, six months. All charges and expenses connected with inspection and quarantine from the time of arrival must be paid by the owner of the stock.

Live Stock for the Transvaal.

The Director of Agriculture for the Transvaal states* that well-bred animals of all kinds are greatly needed in that country, but that until diseases are got more under control and local conditions better understood their importation will always be attended with considerable risk, and should only be undertaken on a limited scale and under circumstances which ensure the animals being suitably accommodated and attended to on arrival. A great interest is taken in live stock, and only shortness of money and the risks attendant upon acclimatisation prevent the farmers from importing largely. Later on, when these difficulties are removed, a good trade may be expected for pedigree stock of all descriptions.

A summary of the Transvaal regulations as to importation of live stock appeared in this *Journal*, March, 1903 (Vol. IX., No. 4, p. 532).

* Transvaal Department of Agriculture Report, 1903–4.

Relation of Food to Milk Production.

The study of dairy problems forms an important feature of the work of the Wisconsin Experiment Station, and during the past six years a herd of about thirty-eight cows and five bulls has been maintained for the purpose of affording material for scientific investigation into the composition of milk, butter, and cheese, and into the best system of feeding for a large and economical production of milk. Some of the data which have accumulated have been summarised for the information of farmers in a bulletin recently issued on the relation of food to dairy production. It is pointed out that the production of a cow is influenced in amount or character by a number of different factors, such as the inherent dairy qualities of the cow, the period of lactation, the age of the cow, and the character and amount of the food supplied.

Great differences exist between different cows in regard to the food consumed for the production of a unit of milk or of butter-fat. No farmer can appreciate how important this difference is until he weighs and tests the milk from each cow in his herd and determines with some degree of accuracy the amount of food eaten. Thus if the cows in the University herd be separated into three groups according to their average production during the years 1898–1903, it was found that one group produced 28 lb. of milk, the second group 23 lb., and the third 18 lb. of milk per day. There was no very great difference in the food actually consumed by each group, so that whereas the best cows produced 100 lb. milk on food containing 89 lb. of dry matter, the cows giving medium and low yields consumed for the same result 105 and 125 lb. of dry matter. The cows producing the largest quantities of milk and butter-fat were, therefore, much more profitable, and it is of the highest importance to the dairy farmer that he should be in a position to know exactly the quantity of milk yielded, with its average content of butter-fat, by each cow in his herd. In this connection attention may be drawn to the opportunities now afforded to farmers in Great Britain for testing their milk, of which an account was given in this *Journal*, March, 1905.

Food has only a secondary influence on the quality, *i.e.*, the richness, of the milk produced by cows, provided they are given

sufficient food to maintain their weight while in milk. A cow that normally produces 3 per cent. of fat cannot be made to give milk containing 4 per cent. of fat by any special system of feeding known, nor can the proportion of fat in the milk to the other milk solids be changed at will by the food. The quality of the milk produced by a cow is determined by her in-bred characteristics, and cannot be changed to any extent by feeding special foods or by changing the system of feeding. At the same time, it is considered that there is evidence to show that feeding-stuffs of a nitrogenous character, like oil-cake, &c., have a beneficial influence on the quality of the milk produced, and that, in general, the best quality and also the largest quantity of milk which a cow is capable of producing will be obtained by feeding rations fairly rich in protein. A comparison between the yields of fourteen cows in the University in 1903–4 and the previous year is mentioned as supporting this view, and similar results are stated to have been obtained elsewhere. In the case referred to, an increase in the nitrogenous food fed during the winter to the same cows gave an increase of nearly one-third per cent. of fat, though the influence of differences in the age and live weights and the uneven milking periods make anything like exact comparison difficult of attainment. It is said, however, that in all the experiments made, at least four-fifths of the cows have responded to a heavier nitrogenous feeding by producing milk of a somewhat better quality and increased quantity. The improvement obtained in the quality has generally been less than one-half per cent., and on the average not more than two or three-tenths of 1 per cent. The beneficial effect of albuminoids on the milk secretion should, therefore, be borne in mind, and where larger quantities of nitrogenous foods can be given, somewhat better results, both as regards the quality and the amount of milk produced by the cows, may be expected.

Effect of Milking Interval on Percentage of Fat.

A large number of samples of mixed milk and milk from individual cows have been examined in the Laboratory of the Agricultural Department Reading College. In some cases where complaints have been made by purchasers in regard to the poor fat content of certain "morning" churns consigned to them by farmers, it has been found that individual cows of the herd have given milk with less than 3 per cent. of fat. In all cases this has been met with in morning milk only. The deficiency in fat has always disappeared when the interval between the evening and morning milkings has been shortened.

Many farmers try to improve the quality and bring it up to the legal standard by extra high feeding, but this, it is pointed out, rarely or never succeeds when the interval between the milkings is too long, and attempts to improve matters in this way are of no avail. Even if extra wages have to be paid to the men the interval must be shortened.

These observations may be compared with the investigations of Dr. Crowther, Lecturer in Agricultural Chemistry in the Yorkshire College, which were summarised in this *Journal* (June, 1904, p. 166). Dr. Crowther pointed out that the yield in the morning is greater than that in the evening. Morning milk, further, is much poorer in fat, but usually slightly richer in solids-not-fat than evening milk. The differences are, however, very considerably less when the intervals between consecutive milkings are equal. Further, the mixed morning milk of a dairy Shorthorn herd may often contain less than 3 per cent. of fat during summer or early autumn if the milking be performed at the usual unequal intervals. Dr. Crowther, therefore, is of opinion that an improvement in the quality of the morning milk can be effected mainly by equalising the periods between successive milkings, an opinion which coincides with that of the authorities of the Reading College, mentioned above. The liberal supply of concentrated, highly nitrogenous food at the morning meal is also mentioned by Dr. Crowther as a means of effecting an improvement in the morning milk. On this point reference may be made to the article in the current number on the "Relation of Food to Milk Production."

Hegelund Method of Milking.

The Hegelund method of milking attracted considerable attention on the Continent and elsewhere a few years ago, and a detailed account of the system appeared in this *Journal* in June, 1903 (Vol. X., p. 65). It is claimed for this method that it increases the production and improves the quality of the milk, and that it has a beneficial influence on the dairy qualities of the cows so milked. Several experiments* have been made with a view of testing the matter, the results of which, however, are not entirely in agreement. Professor Henkel carried out a trial with thirty-seven cows at Weihenstephan, which was considered to show that the Hegelund method increased the average yield of milk per cow by 3·4 per cent., while the percentage of fat in the milk was raised by 12 per cent. In some experiments at Allgän, the conclusions arrived at were that the method conduced to (1) cleanliness, (2) to proper milking, so that the cows gave their milk willingly, and (3) to thorough stripping, whereby diseases of the udder were avoided, or, at any rate, were more easily cured ; that more and richer milk was obtained, the animals being stimulated to an increased yield, and it was suggested that the productivity thus acquired might become hereditary.

At the Danish Experimental Laboratory it was concluded that there was probably no change in the fat-content of the milk, although a small quantity extra of specially rich milk was obtained ; this was only done at the cost of the following milking, so that the total percentage did not change. There were indications, however, that the total quantity of milk was rather greater, but it was pointed out that the new method demanded greater care and skill than was usually given, and that probably as good results would be obtained with the ordinary method if the same care and skill were applied. These views met with great opposition among practical Danish agriculturists, by whom it is considered that the "massage" of the udder involved in the Hegelund method causes the cow to give a greater and certainly a richer yield of milk. Results obtained at the Experimental Dairy at Hoorn, in Holland, point, however, to the same conclusion as that referred to above, viz., that

* *Deutsche Land. Presse.* 1904 : Nos. 16, 34 and 42. 1905 : No. 26.

the value of the method depends on the care and thoroughness of the milking.

Investigations have also been made by Dr. Wenck, of the Agricultural Institute of Leipzig University, who states that the milk which is obtained by this method after the ordinary milking is not to be regarded as an addition, but rather as an advance, on the yield of the following milking. The success of the Hegelund method depends on the stimulating effect exercised on the udder by the thorough milking, and he points out that cows should be thoroughly milked, not because more fat is to be obtained, but because the productivity of the udder is by that means fully developed.

The general adoption of the Hegelund method is not recommended by Dr. Wenck, because any increase which might be obtained is not, in his opinion, sufficient to cover the extra cost. Only with a very skilled staff and with the closest supervision could the method be made successful. Cleanliness becomes more difficult of attainment than in ordinary milking, and he thinks that the highest returns are to be obtained not through the adoption of the Hegelund method but by the employment of reliable and skilful milkers, who recognise the importance of careful milking and are looked after by a capable overseer.

Manuring of Fruit Trees.*

On strong clay it is known that the roots of fruit trees often suffer through lack of air, and attention was drawn in an earlier number of this *Journal* (Oct., 1904, p. 432) to a method adopted in some parts of Germany of securing the aeration of the soil by placing layers of hedge brushings and similar material beneath the roots when planting. Herr Pfeiffer, of the Oppenheim School of Fruit Culture, has recently given an account in the *Deutsche Landwirtschaftliche Presse* of the successful results obtained by him by a system of green manuring, results which he considers are largely due to the opening of the soil both by the plant roots and by the ploughing in of the green crops.

* See *Journal*, Apl., 1905, p. 32.

This is a point to which Pfeiffer attaches great importance, and he recommends that plants should be selected for the green crop the roots of which will penetrate the subsoil and prepare the way for the roots of the young trees. By this means also the subsoil moisture is made available, which in a dry year, such as 1904 was in Germany, is of great importance. The crop selected for this purpose was peas. The soil was deeply cultivated in autumn and left in a rough state ; in spring, about the end of March, peas were sown broadcast on the undisturbed sod. From the middle to the end of June the crop was ploughed under, and shortly after mustard was sown in order to employ the nitrogen from the peas. The mustard grew luxuriantly and reached a height of four to six feet ; in autumn the mustard was ploughed under, and its strong stalks served to keep the soil open and expose it to the frost and weather. By this system no other manure is necessary. The cultivation of crops between the rows is not recommended, except perhaps on well manured soil. After three or four years of green manuring, strawberries might be planted and cropped for two years, and then green manuring resumed ; or vegetables might be grown, the same crop only recurring on the same plot every six or eight years. The first crop of green manure, *i.e.*, peas, can, if desired, be used for fodder, as the roots will supply sufficient nourishment to the mustard.

Manuring of Forest Trees.

Forest trees, after they have left the nursery, are not usually considered to require manure even in the early stages of their growth, and no special measures are taken to prepare the soil before transplanting. Within the last few years, however, the advisability of cultivating and manuring the soil before planting out has attracted attention in Belgium, Germany, and Holland, and, so far as experiments have gone, it may be concluded that a considerable increase in growth may be obtained by this means. A scheme* has been drawn up for a series of trials, to be conducted under the direction of the German Agricultural

* *Mitt. deutschen Land. Gesellschaft*, 29 Apl., 1905.

Society, for the purpose of ascertaining what form of manuring is likely to give the best results; one set of these proposed experiments provides for planting on soil which is (1) uncultivated; (2) cultivated, but unmanured; (3) green manured without artificials; (4) green manured, with the addition of lime; and (5) green manured, with the addition of 800 kg. basic slag and 400 kg. kainit. Another set provides for the application of various combinations of artificial manures, but without green manuring.

Several experiments have already been made in Germany, but sufficient time has not yet elapsed for any definite conclusion to be arrived at, though in one case at Eberswalde, where a trial was begun in 1901, the trees on the manured plots show a marked advantage over the unmanured plots.

In this connection it may be of interest to record some observations on the subject of forest manuring recently made by Dr. Schwappach, of Eberswalde. Dr. Schwappach considered that nitrogen was the most important requirement for forest plants. Lime, however, is regarded as important, as it helps to make the stores of humus available for plant food. In many cases, indeed, the favourable effect of basic slag seems due to the lime which it contains. As only the cheapest manures can be profitably employed in forestry, leguminous plants are of the first importance as sources of nitrogen, while in other cases slow and long-acting manures should be employed. Careful management of the humus is a point which is considered deserving of special attention, as it is the only source of plant food in the later stages of the trees.

On poor soils, German experience shows that a preliminary cultivation by green manuring, with the application of basic slag, is a most successful method of securing a good growth from young plants. The cultivation of leguminous plants offers also the best means of deepening the soil. It is pointed out, however, that guidance as to proper manuring should be obtained from an analysis of the soil. The cost of manuring will be well repaid by the rapid growth of the young trees and by their successfully resisting the diseases and dangers attending the early stages of growth.

Rating of Woodlands.

The attention of the Board has been drawn to the fact that the statutory provisions dealing with the rating to the Poor Rate and other local rates of woodlands in England and Wales are not always understood by the owners and occupiers of such land. They think, therefore, that it may be useful to reproduce a memorandum prepared by the Local Government Board in July, 1902, for the information of the Departmental Committee on Forestry.

Poor Rate.—The authority for the levy of the Poor Rate is derived from Section 1 of the Poor Relief Act, 1601 (43 Eliz., c. 2). That statute authorised the taxation by the overseers of every inhabitant, parson, vicar, and other, and of every occupier of lands, houses, tithes impropriate or propriations of tithes, coal mines, or saleable underwoods, in the parish for which the rate was made.

The statute of Elizabeth authorised the rating of the underwood itself, and it appears to have been considered that land upon which saleable underwood grew was not assessable to the Poor Rate. The express mention of saleable underwoods in the statute was also held to imply that wood not within this term was exempt from the Poor Rate. Thus in "Rex *v.* Inhabitants of Minchinhampton" (1762), 3 Burr, 1309–12, it was held that beech being timber according to the custom of the place in which the question arose was not rateable, and in "Rex *v.* Inhabitants of Ferrybridge" (1823), 1 B. and C., 375 firs and larches planted with oaks for the purpose of sheltering the latter, and cut as the oaks grew larger, were considered to be similarly exempt.

But by Section 14 of the Rating Act, 1874 (37 and 38 Vict., c. 54), so much of the statute of Elizabeth as related to the taxation of an occupier of saleable underwoods was repealed, and by Section 3 of the Act, the statute of Elizabeth, and the Acts amending the same, were extended to land used for a plantation or a wood or for the growth of saleable underwood, and not subject to any right of common.

Under this enactment it is the land, and not the timber, underwood, or other produce of the land, which is made the subject of assessment, and it would seem that if land used as a

plantation or a wood or for the growth of saleable underwood is subject to common rights, it is exempt from the Poor Rate and other local rates.

The method of estimating the gross estimated rental and rateable value of such woodlands is prescribed by Section 4 of the Act, and is as follows :—

"(*a*) If the land is used only for a plantation or a wood, the value shall be estimated as if the land instead of being a plantation or a wood were let and occupied in its natural and unimproved state.

"(*b*) If the land is used for the growth of saleable underwood, the value shall be estimated as if the land were let for that purpose.

"(*c*) If the land is used both for a plantation or a wood and for the growth of saleable underwood, the value shall be estimated either as if the land were used only for a plantation or a wood, or as if the land were used only for the growth of the saleable underwood growing thereon as the Assessment Committee" (or where there is no Assessment Committee the persons making the Poor Rate) "may determine."

Two decisions have been given by the Queen's Bench Division of the High Court upon the construction of Section 4 of the Act of 1874. In the case of the "Earl of Westmorland *v.* Southwick and Oundle," (1877), 36 L.T. n.s. 108; 41 J.P. 231, it was decided that in ascertaining the rateable value of a plantation or wood as "land let and occupied in its natural and unimproved state," it was not admissible to base the estimate upon the rent which a hypothetical tenant would give after expenditure had been laid out in grubbing up woods, in draining and fencing, and in making roads. In the case of "Eyton *v.* Mold Churchwardens and Overseers" (1880), L.R. 6 Q.B.D. 13, 50 L.J.M.C., 39; 43 L.T. 472, it was held that the value of a right of sporting over land might properly be included in estimating the rateable value of a plantation or wood as land in its natural and unimproved state.

Where the rateable value of woodlands was increased by reason of the same being estimated in accordance with Section 4 of the Act of 1874, an occupier under any lease or

agreement made before the commencement of the Act (for this purpose, the 6th April, 1875), was empowered to deduct from his rent during the continuance of the lease or agreement any additional sum paid as rates in respect of such increase of rateable value (37 and 38 Vict., c. 54, section 5).

Woodlands are not agricultural land within the meaning of the Agricultural Rates Act, 1896, and an occupier of woodlands is liable to pay the full amount in the pound of any Poor Rate assessed upon him in respect of such property.

Other Local Rates.—By Section 10 of the Rating Act, 1874, any hereditament made rateable to the Poor Rate under that Act became subject to all other local rates leviable upon property rateable to the relief of the poor. Woodlands are thus rateable to a General District Rate made by a Town Council or Urban District Council under Section 210 of the Public Health Act, 1875 (38 and 39 Vict., c. 55), or to any separate rate for special sanitary expenses levied by overseers in a rural parish under Section 230 of the same Act, or to any Lighting Rate levied in a rural parish under the Lighting and Watching Act, 1833 (3 and 4 Will. IV., c. 90).

In the case of the General District Rate an occupier of woodlands is to be assessed on one-fourth part of the rateable value [38 and 39 Vict., c. 55, section 211 (1) (b)]. Similarly an occupier of woodlands is to be assessed to a separate rate for special sanitary expenses, where a special assessment is made for the rate, on one-fourth part of the rateable value, or if no special assessment is made he pays one-fourth part only of the rate in the pound payable in respect of houses and other property (38 and 39 Vict., c. 55, s. 230).

As regards a Lighting Rate levied under Section 33 of the Lighting and Watching Act, 1833, it is open to question whether an occupier of woodlands is liable to pay one-third only of the rate in the pound payable by an occupier of houses, buildings, and property other than land (3 and 4 Will. IV., c. 90, s. 33; 37 and 38 Vict., c. 54, ss. 3, 10; Reg. *v.* Somerset Justices [1858] 22 J.P. 431, 31 L.T. o.s. 215).

The doubt as to the position created by the 37 and 38 Vict., c. 54, in this instance originates in the decision of the House of Lords in the case of " Thursby and Another *v.* the Church-

wardens and Overseers of the Parish of Briercliffe with Entwistle" (L.R. 1895 A.C. 32).

Upon the reasoning adopted in that case, it would seem to be arguable that the occupiers would be rateable on the higher scale. But it is possible that a further judicial decision may be needed to settle the doubt.

Where the Public Libraries Act, 1892, is in force in a rural parish the rate levied to meet the expenses of the library authority is raised by the overseers with and as part of the Poor Rate, but a person assessed in respect of woodlands to the Public Library Rate is entitled to an allowance of two-thirds of the sum assessed upon him (55 and 56 Vict., c. 53, s. 18).

The expenses of County Councils, School Boards, and the expenses of Rural District Councils chargeable as general expenses under Section 229 of the Public Health Act, 1875, Section 29 of the Local Government Act, 1894, or any other Act, are usually defrayed out of the Poor Rate, but where part only of a parish is liable to be assessed to meet any of these expenses, a separate rate may be levied by the overseers over the area liable.

A separate Borough Rate and a Watch Rate may also be levied in some instances by Town Councils of boroughs, and separate Highway Rates are also raised in some boroughs and urban districts.

In the absence of any special provision on the subject in a local Act, an occupier of woodlands would be liable to pay any of the separate rates above referred to, like the Poor Rate, in full.

A Conifer Disease.

Quite recently a batch of diseased spruce seedlings was sent to the Royal Botanic Gardens, Kew, from upland Yorkshire, accompanied by a statement that the disease was most prevalent at the crowded end of the seed-bed; the portion where the plants were not so crowded appeared to be fairly free from it. Examination showed the disease to be caused by a fungus called *Herpotrichia*

nigra by Hartig, who recorded it as an injurious parasite in the spruce woods of the Bavarian Forest.

The leaves are attacked and killed by the fungus, but instead of falling when dead they are bound together by mycelium, and remain as a compact brown mass clustered round the branch from which they sprang. These dense clusters of dead leaves, fixed to the branches by dark-coloured cobweb-like mycelium,

SEEDLINGS OF SPRUCE ATTACKED BY "HERPOTRICHIA NIGRA."

are very characteristic. The fruit of the fungus and also minute sclerotia are produced on the leaves.

The parasite is most prevalent in nurseries at high elevations, and has been recorded as attacking spruce (*Picea excelsa*), mountain pine (*Pinus montana*), and juniper (*Juniperus communis*). It occurs in Germany and Norway. It does not appear to have been previously recorded in Great Britain.

The following observations with a view to its prevention are

made by Hartig* :—"It is an interesting biological point that the fungus grows, especially when the temperature is low, under the snow or during the time it is melting, because under such circumstances the air is completely saturated with moisture. The frequency of the disease at high elevations has led to the general adoption of the practice of forming spruce nurseries at low altitudes. It has also been found a good plan to look over the nurseries immediately after the melting of the snow, and to raise up all prostrated plants in order that they may be exposed to the wind. It would also be a step in the right direction in planting out trees to set them on hillocks and similar elevations, and to avoid placing them in hollows and other depressions."

It is important that diseased seedlings should be collected and destroyed by burning, otherwise the numerous fruits and sclerotia present on the leaves would prove a source of danger in the future.

Railway Rates for Foals.

The Board are informed that the railway companies which are parties to the clearing system have, as from April 1st last, reduced their charges for the carriage of foals having the exclusive use of a horse-box.

The rates at present in force are as follows :—

1 foal having the exclusive use of a horse-box	...	as for 1 horse.
2 foals in one horse box	...	as for 1½ horses.
3 foals in one horse-box	...	as for 2 horses.
4 foals in one horse-box	...	as for 2½ horses.
above 4 foals in one horse-box	...	as for 3 horses.

Under these rates a foal is carried for the same fare as a horse, instead of a fare and a-half as formerly.

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* "Text-Book of Diseases of Trees." (Hartig and Somerville, Engl. Ed., p. 76.)

Railway Charges in Italy.

The cultivation of fruits, flowers, and vegetables forms an important branch of agriculture in the Southern Departments of France, and its development has to some extent enabled growers to escape the depression which has affected other farm crops. Recently, however, there has been some decline in the exportation of table fruits to Great Britain, Germany, and Belgium, and attention is drawn in a Report* by M. Foex, Inspector-General of Agriculture, presented to the Société Nationale d'Encouragement á l'Agriculture, to the influence on this trade of the favourable rates accorded by the Italian railways to the export of fruit and vegetables from that country. The facilities thus enjoyed, and also the advantages granted to this traffic by the German, French, and Belgian railways, place, it is contended, French exporters and producers in an inferior position to their Italian rivals.

The position of Italy in the export trade is due, M. Foex states, not so much to circumstances favourable to production or to any superiority in the products as to the organisation and cheap rates for transport by railway. Perhaps the most important point is the system of accelerated goods traffic, which is nearly as fast as the express service. At the same time the charges are materially reduced for waggon loads of not less than 4 tons, with further reductions for additional tonnage up to the capacity of the truck. The company also allow a discount according to the number of waggons used by the same consignee annually: thus for a minimum of fifty waggons a discount of 4 per cent. is given, while for 1,000 waggons as much as 9 per cent. is allowed. Special rates are also made for contracts for the use of 1,500 waggons annually. The necessity for sending consignments of not less than 4 tons, which might be difficult in some cases, as for example early vegetables, is got over by the fact that a waggon carrying goods of the same class is allowed to load at three stations, provided the full tonnage is paid for at the starting place. The tariff is applied to food products generally (fruits, fresh vegetables, milk, cattle, eggs, cheese, meat, fish, &c.), and the simplicity of this

* Appendix to the Report on the French Budget of 1905.

arrangement is regarded as a contributory cause in the development of Italian exports.

The Report concludes with a recommendation urging the adoption in France of the methods which it is contended have been found successful in Italy, in particular; the employment of a single tariff for agricultural products; the introduction of an accelerated goods traffic; the allowance of a discount proportionate to the number of waggons despatched annually by a single consignee; and the completion of a waggon load from three separate stations.

International Agricultural Conference.

His Majesty the King of Italy has invited the co-operation of the British Government in the formation of an International Chamber of Agriculture, consisting of representatives elected by the great agricultural associations and of delegates appointed by the different Governments.

The purposes of the International Chamber of Agriculture, as explained by the Italian Government, would be to give information, to advise, to guide and direct on the following subjects:—Diseases of animals and entomological subjects; insurance against loss by hail, frosts, drought, &c., and the mortality of live stock; the regulation of forests and watersheds; the adulteration of agricultural products and the institution of an agricultural trade-mark; emigration and immigration; and the formation of an exchange for agricultural labour; technical improvements in agricultural methods and the formation of a meteorological bureau; the integration of co-operative societies for production and distribution; the creation of exchanges for agricultural products, and defence against railway and shipping trusts, against trusts for the cornering and sale of products and manufacturers' rings; a revision of the tariff system, and the improvement of commercial codes and of labour contracts.

The King has been pleased to approve the appointment of the following gentlemen to be the British delegates to the Conference:—His Excellency the Right Hon. Sir Edwin Egerton,

G.C.M.G.; the Earl of Jersey, G.C.B., G.C.M.G.; the Earl of Minto, G.C.M.G.; Sir Thomas Henry Elliott, K.C.B.; and Mr. T. P. Gill; and Sir Edward Charles Buck, K.C.S.I., on behalf of the Government of India.

The first meeting of the Conference was held at Rome on 28th May last.

Agricultural Department of Cambridge University.

The "Cambridge University Reporter" publishes a letter from the Drapers' Company to Professor Middleton, of the Department of Agriculture, Cambridge, stating that they have had under consideration the application made to them for assistance in providing the new buildings required for the Department of Agriculture in the University of Cambridge. The Company have resolved to grant from their corporate funds the sum of £5,000 towards the cost of those buildings, provided a further sum of £5,000 is raised by voluntary contributions by the 31st of December next.

Administration of the Meteorological Office.

The Lords Commissioners of His Majesty's Treasury have informed the Board that they have had under consideration the Report of the Departmental Committee on the Administration of the Meteorological Office, and have decided that that office will as from the 1st of April last, be placed under the management of a Committee constituted as follows:—The Director of the Meteorological Office; two members nominated by the Royal Society; the Hydrographer of the Navy; one member nominated by the Board of Trade; one member nominated by the Board of Agriculture and Fisheries; and one member nominated by the Treasury. The members of the Committee will be appointed by the Treasury, and will hold office for a period not exceeding five years, but will be eligible for reappointment.

Subject to the general control of the Committee and to such regulations as may be laid down by the Treasury, the Director will be responsible for the administration of the office, and will act as Chairman of the Committee.

The following gentlemen have been appointed members of the Committee:—Mr. W. N. Shaw, Sc.D., F.R.S., Director; Capt. Arthur M. Field, R.N., Hydrographer to the Navy; Capt. A. J. G. Chalmers, Professional Officer of the Marine Department, Board of Trade; Mr. W. Somerville, Sc.D., Assistant Secretary of the Board of Agriculture and Fisheries; Professor G. H. Darwin, F.R.S., University of Cambridge; Professor Arthur Schuster, F.R.S., University of Manchester; and Mr. G. L. Barstow, of the Treasury.

Recent Publications of the Board.

The Annual Report for the year 1904 of the Proceedings of the Board of Agriculture and Fisheries under the several Acts administered in the Land Division of the Department has been published. This Report [Cd. 2453., Price 2½d.] combines the separate reports of proceedings required, under the provisions of various statutes, to be laid annually before Parliament by the Board, as the successors of the Tithe, Copyhold, and Inclosure Commissioners, whose powers and duties devolved in 1882 on the Land Commission, to whose functions the Board of Agriculture acceded on its formation in 1889.

The nature of the varied business arising under the Acts above referred to, and the methods of administration pursued by the Department were fully explained in the Report for 1902,* on which occasion a detailed description was supplied of the statutory functions of the Board in relation to Tithe Rentcharge and Corn Rents, Copyholds, Commons Inclosure and Regulation, Exchange of Lands, Improvement of Land, Land Drainage, Sale of Glebe Lands, Universities and College Estates, Agricultural Holdings, Light Railways, and sundry other matters

* *Cd.* 1519. *Price* 8*d.*

in which the intervention of the Board is necessary. The present Report gives an account of the work during the past year.

The following leaflets have been issued since the previous notice in the *Journal* (January, 1905), and single copies may be obtained free of charge on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.:— The Hessian Fly (No. 125), Sheep Maggot Fly (No. 126), Sclerotium Disease (No. 127), Winter Egg Production (No. 129), Navel Ill of Lambs (No. 130), Apple and Pear Scab (No. 131), Slugs and Snails (No. 132), Powdery Mildew of the Vine (No. 133), Apple Culture (No. 134), Mange in Cattle (No. 135), Bulb Mite (No. 136), Potato Scab (No. 137), Pine Weevils (No. 138), Preparation of Honey for Market (No. 141).

Sectional Volumes of Leaflets.

Arrangements will shortly be made for the issue of sets of leaflets dealing with (1) Acts of Parliament, Co-operation and Miscellaneous Subjects, (2) Farm Animals, (3) Poultry and Bees, (4) Farm and Garden Crops, (5) Wild Animals, Birds, &c., (6) Insects injurious to Crops other than Bush and Orchard Fruit, (7) Insects injurious to Fruit Trees and Bushes, and to Forest Trees, (8) Fungi injurious to Crops and Fruit. These sets will be bound in paper covers, and may be had on prepayment of one penny per set, post free.

Return of Market Prices.

The Board of Agriculture and Fisheries have altered the day of the publication of their Weekly Return of Market Prices from Wednesday to Saturday. It is found that the majority of the principal markets in Great Britain—fifty-two in number—from which official returns of the prices of live stock and agricultural commodities are now obtained, are held early in the week, and the change of day will, consequently, tend to increase the immediate value of the publication to farmers and others interested. The Return for June 3rd is the first issued under the new arrangement.

ADDITIONS TO THE LIBRARY DURING MAY.

Africa—

Agriculture within the Empire. Report of the Boer Delegates on the Stock Farming of Canada, Australia, and New Zealand. (165 pp. + 4 maps + 50 plates.) 1905.

Australasia—

Reeves, W. P.—State Experiments in Australia and New Zealand. (2 vols.) (391 + 367 pp.) 1902.

Western Australia.—Department of Agriculture, Report for 1903-4. (33 pp.)

Tasmania.—Statistics for 1903. (531 pp.)

Austria-Hungary—

Darányi, Dr. I. (translated by *György, A.*).—The State and Agriculture in Hungary. (264 pp.) 1905.

Belgium—

Congrès International d'Horticulture de Liege, May, 1905. Rapports. (124 pp.)

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Experimental Farms.—Reports for 1904. (509 pp.)

France—

Deliège, E.—Marne Agricole. (174 pp.) 1902.

Collin, E., et Perrot, E.—Résidus industriels de la fabrications des huiles et essences utilisés par l'Agriculture. (299 pp.) 1904.

Marre, E.—Race d'Aubrac et le Fromage de Laquiole. (119 pp.) 1904.

Jouzier, E.—Législation rurale. (519 pp.) 1904.

Renault, A., et Goussé, A.—Pays de Craon et ses Porcs. (92 pp) 1904.

Boitelle, A.—Le Meilleur Modèle sous ses différents aspects et la Question Chevaline. (337 pp.)

Plessis de Grenedan, le Comte J. du.—Géographie Agricole de la France et du monde. (424 pp.) 1903.

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Campagne, A.—Vallée de Barèges et le reboisement. (93 pp.) 1902.

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Goltz, Dr. T. F. v. d.—Handbuch der landwirtschaftlichen Betriebslehre. (706 pp.) 1905.

Kellner, Dr. O.—Ernährung der landwirtschaftlichen Nutztiere. (594 pp.) 1905.

Ramann, Dr. E.—Bodenkunde. (431 pp.) 1905.

Deutsche Landwirtschaft. Gesellschaft.—Arbeiten, Heft. 105, Gräsung auf holsteinischen Weiden. (15 pp.) 1905.

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Ward, H. Marshall.—Trees, Vol. II.; Leaves. (348 pp.) 1904.

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Broomhall, W.—Country Gentlemen's Estate Book, 1905. (572 pp.)

Woburn Experimental Station.—Field and Pot Culture Experiments, Report. (1903). (30 pp.) 1905.

Co-operative Wholesale Societies Limited.—Annual for 1905. (439 pp.)

Taylor, S.—Modern Homesteads. (71 pp. + 32 plates.) 1905.

Royal Scottish Arboricultural Society.—Transactions. Vol. XVIII. 1905. (243 pp.)

Willis, J. C.—Flowering Plants and Ferns. (670 pp.) 1904.

Darwin, F.—Elements of Botany. (235 pp.) 1899.

Nicholls, H. A. A.—Tropical Agriculture. (312 pp.) 1900.

Smith, A. B.—Poisonous Plants of all Countries. (88 pp.) 1905.

Aberdeen and North of Scotland College of Agriculture.—Comparative Merits of Varieties of Oats, Report, 1903-4. (37 pp.)

South-Eastern Agricultural College, Wye.—Report on Economic Zoology, 1904-5. (123 pp.)

Board of Trade.—Condition and Prospects of British Trade in Siberia. (103 pp.) 1905. [Cd. 2518.]

India—

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East India.—Correspondence relating to the Training of Forestry Students. (74 pp.) 1905. [Cd. 2523.]

Ireland—

Department of Agriculture.—General Report, 1903-4. (460 pp.)

Italy—

Cosenza, A. G. G.—Riforme Agrarie e Cooperazione in Sicilia. (20 pp.) 1903.

South America—

British Guiana.—Report of the Board of Agriculture, 1903-4. (19 pp.)
British Guiana.—Report on the Lands and Mines, 1903-4. (19 + xxxiii. pp.)

Spain—

Redonet, D. Luis.—Crédito Agrícola. (566 pp.) 1905.

Switzerland—

Trincano, A.—A propos d'un Institut International d'Agriculture et de l'Initiative de S. M. le Roi d'Italie. (26 pp.) 1905.

United States—

Hunt, T. F.—Cereals in America. (421 pp.) 1904.
Fraser, S.—The Potato. (185 pp.) 1905.
Department of Agriculture.—Report No. 80. Progress of the Beet Sugar Industry in United States, 1904. (183 pp.)
Bureau of Animal Industry :—
Bull. 67. Necrotic Stomatitis. (48 pp.) 1905.
Bull. 69. External Parasites of Hogs. (44 pp.) 1905.
Bull. 70. Milk Supply of Twenty-nine Southern Cities. (40 pp.) 1905.
Bull. 71. Camembert Type of Soft Cheese in United States. (29 pp.) 1905.
Bull. 72. Etiology of Hog Cholera. (101 pp.) 1905.
Bureau of Chemistry :—
Circ. 15. Results of Borax Experiment. (27 pp.) 1905.
Circ. 23. Methods for the Examination of Maple Products. (8 pp.) 1905.
Bureau of Entomology :—
Circ. 58. Report on the Gypsy Moth and the Brown-tail Moth, July, 1904. (12 pp.) 1905.
Circ. 59. Corn Root-worms. (8 pp.) 1905.
Circ. 60. Imported Cabbage Worm. (8 pp.) 1905.
Farmers' Bulletins :—
No. 215. Alfalfa Growing. (39 pp.). 1905.
No. 218. School Garden. (40 pp.) 1905.
No. 221. Fungous Diseases of the Cranberry. (16 pp.) 1905.
No. 222. Experimental Station Work. (32 pp.) 1905.
Bureau of Plant Industry :—
Bull. 68. North-American Species of Agrostis. (59 pp. + xxxvii. plates.) 1905.
Bull. 76. Copper as an Algicide and Disinfectant in Water Supplies. (55 pp.) 1905.
Bureau of Soils :—
Bull. 26. Investigations in Soil Management. (205 pp.) 1905.
Bureau of Statistics :—
Bull. 31. Imports of Farm and Forest Products, 1901-3. (66 pp.) 1905.
Bull 32. Exports of Farm and Forest Products, 1901-3. (100 pp.) 1905.
Bull. 33. Trade with noncontiguous Possessions in Farm and Forest Products, 1901-3. (40 pp.) 1905.
Kansas State Agricultural College :—
Bull. 126. Experiments with Hand-fed Calves. (161–198 pp.) 1905.
Bull. 127. Roots of Plants. (199–252 pp.) 1905.
Virginia Agricultural Experiment Station :—
Bull. 150. Composition of Cider as Determined by Dominant Fermentation with Pure Yeasts. (34 pp.) 1904.
Bull. 151. Apple Production in Virginia. (35–58 pp.) 1904.
Bull. 152. Experiments with Caustic Soda and some Patent Washes against the San José Scale. (59–67 pp.) 1904.
Bull. 153. Horn Fly. (68–77 pp.) 1904.

West Indies—

Department of Agriculture.—Sugar Cane Experiments in the Leeward Islands, 1903-4. Report. 2 vols. (75 + 48 pp.)
Department of Agriculture.—Information in regard to Agricultural Banks. (56 pp.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of May, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 10	7 6	37 1	34 3
Herefords	7 11	7 2	—	—
Shorthorns	7 9	7 2	36 4	33 8
Devons	7 9	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¼	7½	8½	7
Sheep :—				
Downs	8½	8	9	—
Longwools	7¾	7¼	8½	7½
Cheviots	8¾	8¼	9¼	8¼
Blackfaced	8¼	7½	8¾	7¾
Cross-breds	8¼	7½	9	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 6	6 0	6 5	5 11
Porkers	7 0	6 7	6 11	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 2	17 8	20 16	17 9
,, —Calvers ...	19 19	16 15	18 13	16 4
Other breeds—In Milk ...	18 4	15 4	19 2	15 8
,, —Calvers ...	—	13 7	18 8	15 8
Calves for Rearing	2 5	1 16	2 13	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	9 7	8 1	10 11	8 9
,, Two-year-olds	13 4	11 16	14 19	13 0
,, Three-year-olds	16 4	14 13	17 2	14 16
Polled Scots—Two-year-olds	—	—	16 11	13 18
Herefords— ,,	15 15	13 18	—	—
Devons— ,,	13 4	11 12	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	47 3	43 0	—	—
Scotch Cross-breds ...	—	—	39 2	34 6
Store Pigs :—				
Under 4 months	27 3	20 3	23 7	18 6

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	53 6	54 0	52 0	50 6	53 6*	53 0*
	2nd	51 6	50 0	47 0	48 6	51 6*	48 6*
Cow and Bull ...	1st	—	47 0	45 6	45 0	44 6	40 6
	2nd	—	42 0	40 0	41 0	41 0	35 6
U.S.A. and Canadian :—							
Birkenhead killed	1st	52 0	53 0	50 0	50 0	—	—
	2nd	48 0	49 0	46 0	46 6	41 0	42 0
Argentine Frozen—							
Hind Quarters ...	1st	32 6	32 6	32 6	32 6	33 0	33 0
Fore „ ...	1st	23 6	24 0	24 0	23 6	25 6	25 0
Argentine Chilled—							
Hind Quarters ...	1st	42 6	44 0	41 6	42 0	—	40 0
Fore „ ...	1st	29 0	29 0	27 6	27 0	—	28 6
American Chilled—							
Hind Quarters ...	1st	56 0	54 0	54 0	54 0	55 6	55 6
Fore „ ...	1st	35 0	34 6	34 6	33 0	36 0	36 0
VEAL :—							
British	1st	62 6	63 6	70 6	76 0	—	70 0
	2nd	50 0	52 6	63 6	69 6	—	—
Foreign	1st	62 6	—	59 0	60 6	—	59 6
MUTTON :—							
Scotch	1st	73 6	—	80 0	78 6	73 6	73 6
	2nd	63 0	—	74 0	73 6	69 0	63 0
English	1st	72 6	68 6	73 6	73 0	—	—
	2nd	64 6	57 0	67 6	67 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	61 0	63 0	63 6	65 6	—
Argentine Frozen ...	1st	35 0	34 0	33 0	32 6	33 0	34 0
Australian „ ...	1st	32 0	29 6	31 0	32 6	34 6	—
New Zealand „ ...	1st	47 6	46 0	44 6	42 0	36 0	—
LAMB :—							
British	1st	91 0	90 6	95 0	97 6	105 0	100 6
	2nd	84 0	80 0	89 0	90 6	102 6	84 0
New Zealand ...	1st	54 0	55 0	52 6	53 0	55 6	56 6
Australian	1st	48 0	49 6	46 0	46 0	46 6	—
Argentine	1st	45 6	48 6	49 0	48 6	—	46 6
PORK :—							
British	1st	58 6	60 0	56 0	56 6	55 6	51 6
	2nd	50 6	53 0	46 6	51 6	52 0	45 6
Foreign	1st	57 0	57 0	56 6	56 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ...	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1	30 8	22 5	19 10	24 10	18 4	16 6	18 3
,, 20 ...	27 10	26 9	30 10	23 7	20 4	24 8	18 5	16 7	18 5
,, 27 ...	27 8	26 9	30 11	23 7	19 8	24 4	18 5	16 7	18 8
June 3 ...	27 6	26 10	31 3	23 10	18 8	23 6	18 4	16 8	19 1
,, 10 ...	27 8	26 6		21 5	18 5		18 7	16 10	
,, 17 ...	27 6	26 5		20 7	18 2		18 3	16 8	
,, 24 ...	27 6	26 5		22 0	19 2		18 6	16 10	
July 1 ...	27 9	26 4		20 7	18 8		18 6	17 1	
,, 8 ...	28 1	26 6		19 11	19 8		18 3	17 1	
,, 15 ...	28 3	26 10		20 5	18 9		18 7	17 6	
,, 22 ...	28 7	27 7		20 10	18 10		18 5	17 6	
,, 29 ...	28 11	28 0		21 0	19 9		18 6	17 10	
Aug. 5 ...	29 3	28 3		20 1	19 9		18 8	17 10	
,, 12 ...	29 11	28 4		21 3	19 9		18 10	17 7	
,, 19 ...	29 9	28 8		20 4	22 5		18 6	16 7	
,, 26 ...	30 0	29 5		22 3	23 2		18 7	16 5	
Sept. 2 ...	30 3	30 2		22 5	25 3		18 5	16 3	
,, 9 ...	28 6	30 0		22 4	24 10		17 0	16 1	
,, 16 ...	27 5	29 7		24 2	24 9		16 4	15 11	
,, 23 ...	27 0	29 10		24 0	25 10		16 2	15 9	
,, 30 ...	26 3	29 10		23 9	25 5		15 9	15 8	
Oct. 7 ...	25 10	30 2		23 8	25 6		15 6	15 9	
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ...	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		WHEAT.		BARLEY.		OATS.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	April ...	36 9	40 4	22 2	24 6	16 8	19 9
	May ...	35 11	40 10	21 11	24 11	16 5	20 7
Paris:	April ...	37 5	41 3	21 0	25 9	16 5	20 5
	May ...	35 11	42 6	20 9	25 10	16 5	22 4
Belgium:	April ...	30 0	30 8	21 7	23 10	15 3	20 5
Berlin:	March ...	37 11	37 11	—	—	18 1	19 11
Breslau:	March ...	37 2	35 7	22 3	26 5	16 5	19 10

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of May, 1904 and 1905.

—	WHEAT.		BARLEY.		OATS.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	26 9	31 9	18 2	23 6	17 3	19 5
Norwich	27 11	31 0	21 6	24 10	15 10	17 8
Peterborough ...	25 3	30 5	18 8	22 9	15 4	18 3
Lincoln	26 0	29 9	18 9	22 0	15 9	18 1
Doncaster	26 2	29 1	21 5	28 2	16 8	17 6
Salisbury	27 2	30 7	20 10	22 2	16 7	18 7

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	12 0	11 0	—	—	—	—	13 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	93 6	91 6	96 0	93 6	—	—	95 0	—
Danish ...	100 0	98 0	103 6	100 0	102 0	100 0	100 6	—
Russian ...	92 0	90 0	98 0	95 0	92 0	90 0	93 6	90 0
Australian ...	92 6	90 6	—	—	91 0	89 0	94 0	—
New Zealand...	94 0	92 6	—	—	95 6	93 6	97 0	—
CHEESE :—								
British, Cheddar	74 0	60 0	—	—	72 0	66 0	61 6	57 0
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	63 0	53 0	60 0	55 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	56 0	55 0	58 0	55 0	54 6	52 6	57 0	55 0
BACON :—								
Irish	67 6	62 6	68 0	63 6	67 0	63 6	65 6	62 6
Canadian ...	59 0	56 6	58 0	56 0	55 0	51 0	60 6	57 6
HAMS :—								
Cumberland ...	98 6	80 6	—	—	—	—	—	—
Irish	98 6	80 6	—	—	—	—	96 0	86 0
American (long cut) ...	49 6	46 6	49 0	45 0	51 0	46 6	54 0	51 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	9 5	8 3	—	—	—	—	—	—
Irish	8 4	7 4	7 0	6 7	7 6	6 9	6 10	6 3
Danish ...	8 4	7 4	8 7	6 10	—	—	8 1	7 2
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	52 6	43 6	49 6	44 6	55 0	—	—	—
Main Crop ...	86 0	68 6	80 0	62 0	66 6	60 0	40 0	35 0
Up-to-Date ...	67 6	60 6	83 0	65 0	51 6	46 6	45 0	40 0
HAY :—								
Clover... ...	86 0	78 0	85 0	71 6	80 0	67 6	75 0	66 0
Meadow ...	76 0	69 6	69 0	63 6	57 6	45 0	72 6	64 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MAY. 1905.	MAY. 1904.	5 MONTHS ENDED MAY. 1905.	5 MONTHS ENDED MAY. 1904.
Swine-Fever:—				
Outbreaks	95	161	317	587
Swine Slaughtered as diseased or exposed to infection ...	372	694	1,510	3,122
Anthrax:—				
Outbreaks	86	118	446	456
Animals attacked	124	261	658	721
Glanders (including Farcy):—				
Outbreaks	106	120	494	608
Animals attacked	173	211	888	1,118
Sheep-Scab:—				
Outbreaks	27	36	632	1,034

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MAY. 1905.	MAY. 1904.	5 MONTHS ENDED MAY. 1905.	5 MONTHS ENDED MAY. 1904.
Swine-Fever:—				
Outbreaks	4	7	10	45
Swine Slaughtered as diseased or exposed to infection ...	20	344	329	1,242
Anthrax:—				
Outbreaks	—	—	2	2
Animals attacked	—	—	2	2
Glanders (including Farcy):—				
Outbreaks	—	1	9	4
Animals attacked	—	1	25	19
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	4	28	214	355

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XII. No. 4.

JULY, 1905. [NEW SERIES.]

CO-OPERATIVE DAIRYING IN ENGLAND.

The dairy trade in England is probably on the eve of a revolution. The old methods of marketing the produce of dairy farms appear to have had their day, and the great success of co-operative dairies and cheese factories in other countries, notably in Ireland and Denmark, has caused British farmers and those who have the interests of British agriculture at heart to turn their attention to the application of the principle of combination to the industry at home.

It appears probable (whatever may be urged to the contrary), that butter-making has not any great future in this country, for the simple reason that other countries and our own Colonies are able to send us plentiful supplies of butter at a lower price than the British farmer is prepared, or indeed can afford, to take for his own product.

From an examination of the trade done by those co-operative dairies already in existence (a list of which is given) it will be seen that the sale of whole milk and of cream is the most general form of outlet for the produce of the dairies of this country, and in this connection it is interesting to note that one of the largest co-operative dairies at the present time, viz., the Eastern Counties Dairy Farmers' Co-operative Society, deals almost exclusively in whole milk, and that the Skelldale Dairy, which was established in a district which was regarded as purely butter-producing, found it more profitable, after a very short time, to abandon the exclusive tradition and deal in every other kind of dairy produce, including whole milk, separated milk, bottled whole milk, cream, cream-cheese, and cheese.

It will probably simplify the matter if a short account of the actual working of a dairy is given here—most of the co-operative

R

dairies differing little in practice either from one another or from the ordinary trade concerns. The Skelldale Dairy, near Ripon, may be taken as an example.

The milk is collected from the farmers in the district under agreement, who are bound to strain and cool the milk before placing it in the churns. In some dairies, as at Skelldale, the collection is organised by a system of partial delivery on the part of the farmer under which a lorry is sent out from the dairy stopping at various agreed points upon the main road to pick up the churns, the farmer being allowed ½d. per gallon on milk delivered actually at the dairy door—this in itself being an advantage to the farmer inasmuch as he is able to take up the returned separated milk, or whey (as the case may be), and save a special journey for the purpose. Twopence per gallon is the price paid by the farmer for the separated milk, and this is deducted from the account, which is settled monthly, the amount paid for the whole milk per gallon depending upon an adjustment between the value of the resulting product and the total working expenses.

The ground floor of the dairy at Skelldale is divided into three parts, one of which is built over, the upper portion being really a platform at an elevation, to which ready access is obtained from within the dairy by a flight of steps and from without by a roadway. And here it may be remarked that, where circumstances permit, the differing levels of the ground should be taken advantage of and an inclined plane left, or even made, up which carts can go, thus delivering the milk at a convenient level above the floor of the dairy so that the force of gravity is pressed into the service of economical working.

The floor at Skelldale is of concrete, and a recess built out of the dairy contains the boiler which supplies the steam for running the machinery as well as hot water for cleansing and scalding the bowls and vessels and for heating purposes in winter. And for the floor of a dairy no material should be used except the best Portland cement, since nothing else will stand the incredible wear and tear caused by the rolling of heavy churns, which will quickly wear holes and grooves in the stoutest of floors. A good plan is to mix granite roughly powdered to the size of cowrie shells with the cement. Needless to say that wood or

brick or the pleasant-looking old-fashioned red tiles are the worst possible materials for a dairy floor as they are porous, wear badly and unevenly, and the spaces between either planks, bricks or tiles form from the first the most suitable breeding ground for bacteria.

After the milk is unloaded from the carts, it is weighed and the amount credited to the farmer sending the milk, whose name, to avoid disputes, is usually indelibly stamped upon the churn. Weight is now nearly universally adopted in preference to volume as the method of measurement, both to escape the errors caused by the appearance of froth upon the surface of the milk and also as a superficial test of quality. A gallon of distilled water at a temperature of 60°F. weighs 10 lb., and a gallon of milk under precisely the same conditions should weigh anything between 10·28 and 10·33 lb., or roughly speaking $10\frac{1}{4}$ lb. As each lot of milk is weighed by the manager, his assistant empties the churn into a vat made to hold about 230 gallons.

Flowing out of this vat and controlled by a stop-cock, the milk passes through a smaller vat (which has the effect of steadying the flow), and is then conducted by a pipe to an inverted bell-shaped vessel down the side of which it flows in a thin film. This bell-shaped vessel is heated internally by a steam pipe from the boiler, and the milk is thus raised to a temperature of 90 deg. F. (on the Continent the practice is to heat it much higher), and is then conducted to the separator, the resultant cream being allowed to flow into enamelled pails which are carried to another part of the dairy and placed in ripening vessels.

The separated milk, on the other hand, is conducted over a refrigerator by which it is cooled down to the natural temperature of the water-supply and is received in pails to be weighed, prior to its return to the farmer in proportion to the quantity of whole milk supplied. It is carted away by him and used for the rearing of calves, pigs, &c., and possibly for use in the household to some extent as well.

When the cream is sufficiently ripe it is churned, steam-power being used, and the butter is worked on a circular table revolving by steam under a fluted radius roller thus bringing the butter continually under a gentle pressure which has the effect of pressing out the superfluous moisture, the attendant standing

by and shifting the butter with the Scotch hands as it passes from under the roller. The moisture is carried to the edge of the table by a combination of gravity and centrifugal force, and flows through certain holes pierced at regular intervals at the edge of the table inside the flange and finds its way thence to the dairy drain.

After the butter has been, in the judgment of the attendant, sufficiently worked, it is weighed out into rough lumps of 24 oz. apiece which are converted by means of the Scotch hands into carefully shaped rolls and stamped with the particular design of the dairy. This shows up plainly on the top of the rolls, thus affording a ready means of identification to dealers and customer alike. The finished rolls are carried away to a cold chamber and placed, until such times as they are wanted, upon smooth slabs of slate.

To give an idea of the amount of work done at the Skelldale Dairy a table is given showing the supply of milk dealt with during the years 1892 to 1903 inclusive :—

Year.	Gallons	Year.	Gallons.	Year.	Gallons.	Year.	Gallons.
1892	102,527	1895	121,069	1898	167,653	1901	198,359
1893	115,181	1896	134,753	1899	185,410	1902	193,559
1894	112,069	1897	148,449	1900	223,110	1903	222,500

In the last year (1903) the members were credited with an average of 7d. per gallon for milk delivered at the dairy (taking milk at 10 lb. to the gallon); hence there is no reason for surprise that the dairy has been much appreciated by its members when it is known that under the old system they would have received fully 1d. per gallon less. Moreover, the presence of so well-equipped a dairy in their midst, governed by themselves, has been the means of stimulating the farmers to pay far greater attention than before, not only to dairying but to the best methods of conducting their business.

So much then for a large (perhaps the largest) co-operative dairy doing an all-round trade in dairy produce. Some account may now be given of another, mentioned earlier in this article, as doing a trade exclusively in whole milk.

The Eastern Counties Dairy Farmers' Co-operative Society was formed in 1896 for the purpose of marketing the milk and other produce of its members, who number fifty, the nominal capital of the Society being £1,020, of which £520 has been paid up. At present the business, as far as dairy produce is concerned, has been principally confined to dealing in whole milk, though there has also been a small separate trade done in eggs and poultry. The turnover has been steadily increasing Last year (1904) it amounted to £27,000, and the year before (1903) to £20,000, giving a profit which enabled the Society to pay a dividend of 4 per cent. on the capital, besides a bonus of ½ per cent. to the members on the total value of the sales during the year, and a bonus of ¼ per cent. on the purchases of customers having contracts with the Society.

There is no system here of milk collection, the farmer himself effecting delivery at the station in his own cart, and consigning the milk there either to a dealer with whom the Society has made a contract, or to the Society's representative at Stratford, in East London, or sometimes partly the one and partly the other. By this contract with the Society, the farmer is bound to strain his milk and cool it down to 60 deg. F. at least before placing it in his churns, a rule which is absolutely necessary for his own ultimate benefit, and one which is fairly strictly observed.

The Society, through its representative at Stratford, makes contracts with the retailers for the regular supply of milk, the members, in their turn, contracting with the Society to furnish a certain quantity daily. The contract is usually a half-yearly one, the "summer price" being fixed for the period from March 25th to September 29th, and the "winter price" from September 29th to March 25th. The quantity to be supplied is not an absolutely fixed amount, a certain margin (generally about 10 per cent.) being allowed. Thus, if a farmer thinks he can supply about 100 gallons daily, he contracts with the Society to supply between 95 and 105 gallons daily. If he then sends less than 95 gallons, and the Society, in order to carry out its contracts, is obliged to purchase milk, the farmer has to pay the difference between the contract price and the market price on the deficit. So that if, in the case supposed above, the farmer only sends 90 gallons, and the Society is obliged to buy five

gallons, in order to make up the deficit, at a price ½d. per gallon higher than the contract price, that 2½d. is deducted from the farmer's account. If, on the other hand, the farmer chooses to send more than 105 gallons, he is paid the contract price on 105 gallons, the surplus milk being sold by the Society on his behalf, and the price obtained, whether above or below the contract price, handed to him ; although, of course, if the farmer can and does give the Society's representative at Stratford notice beforehand that he is going to send in a larger quantity of milk than he has contracted to supply, the representative may be able to get a price higher than that named in the contract.

Contracts have been entered into with retail traders all over the East of London, and, as far as possible, the milk supplied by the farmers is distributed to the various stations as circumstances require, so as to avoid unnecessary expense in bringing all the milk to a common centre. Thus, if a dealer in Forest Gate required 80 gallons daily, and there is a member under contract with the Society to supply from 95 to 105 gallons daily such member is instructed to send 80 gallons daily to Forest Gate Station, it being part of his contract that he shall send the milk to whatever station the Society shall require. The remaining 15 to 25 gallons he sends to Stratford Market Station, where it is received by the Society's representative.

If a dealer to whom milk is being directly consigned by a member receives short quantity on any occasion he communicates with the Society's representative at Stratford, who sends him milk to make up the amount contracted for.

Of the milk sent to Stratford, some is distributed by the Society's wholesale van amongst the retail dealers with whom the Society has contracts, and who wish it to be delivered at their own places of business ; the surplus is sold in the market either to retail dealers or to other wholesale buyers. The milk is, generally speaking, kept in the churns in which it was consigned by the farmers, but no attempt is made (except in special cases) to keep the various lots separate, and if there are two churns, each half full, the milk is poured from one to the other to save the space and trouble involved by carrying both.

Sometimes, when there is a glut in the market, it is necessary for the Society to hold over milk from one day to the next,

and in such a case the milk is taken to the Society's depôt and pasteurised or put into cold storage; or it may be sold for separation; or, if the Society happens at the time to have an outlet for cream, it may be put into the hands of a firm with separating plant to be separated for the Society. The Society has recently installed at its depôt refrigerating, cold storage, pasteurising, and separating plant on up-to-date lines, and will henceforth be able itself to deal with its own surplus milk.

When it is necessary for the Society to purchase milk to make up the amount named in its various contracts, it either purchases from other wholesale dealers, or (if its representative knows in advance of the necessity of buying) telegraphs to one of the many cheese factories which, during the summer, sell their milk whole, provided they are offered a certain price for it.

The onus of cleansing the churns fall upon the retail dealer who receives them, or upon the Society when they have been consigned to the representative at Stratford, after which they are returned to the farmer, who, as a rule, supplies the churn in the first instance, though, occasionally, the retail dealer supplies them, and, in one instance, the Society does so.

The increase in the price given for whole milk, owing to the competition introduced into the wholesale trade by this Society, is considerable. Milk that formerly would have fetched 1s. 7d. per barn gallon in the winter months, and 1s. 2d. in the summer, now makes as much as 1s. 8d. and 1s. 4d., respectively.

Such, then, is the procedure at two of the largest and most representative dairies at present at work on co-operative principles in England. There are others, as will be seen from the appended list, and perhaps a few words about a typical cheese-making dairy might usefully be added here.

The Scalford Dairy, Limited, near Melton Mowbray, was established in 1903 for the co-operative production of Stilton cheese, and represents an attempt on the part of the more enterprising of the Leicestershire farmers to help themselves by combination against the competition of the ordinary trading concerns in the county. The Society became the tenants of a disused malting-house, belonging to the Duke of Rutland, who had the building put into thorough repair after carrying out the necessary alterations, and the scheme was taken up with the

greatest zest by the members, who carted all the material and conveyed the produce to and from the dairy free. Moreover, the producers of milk bind themselves to bear any loss that may occur proportionately among themselves, as is shown by the following Clause (No. 15) of the agreement between the dairy and the farmers :—

"15. If on making up the accounts and balance sheet of the dairy for the year ending on the day of 190 it shall be found that the operations of the dairy for such year have resulted in a loss, the amount of such loss shall be apportioned rateably between the several members who have during such year supplied milk to the dairy according to the number of cows from which milk has been supplied. The decision of the committee of management of the dairy with regard to any such apportionment shall be final and conclusive, and the amount apportioned to the contributor shall on demand be paid by him to the dairy, and in default shall be recoverable as liquidated damages."

The first season began on April 21st, 1903, and closed on September 30th, 1903, and the number of cheeses made during that period was 3,420, and the quantity of milk received was as follows :—

May ...	7,961	gallons.
June ...	13,827	,,
July ...	10,049	,,
August	8,717	,,
September ...	6,965	,,
Total ...	47.519	gallons.

The price paid for the milk was 6d. per gallon (10 lb.) delivered twice daily at the dairy, and the whey was bought back by the members at ¼d. per gallon for feeding pigs. That the trade has progressed by leaps and bounds may be seen by the report for the past year (1904), when the number of cheeses made and the number of gallons of milk consumed was as follows :—

April ...	645	cheeses.	April ...	10,080	gallons.
May ...	899	,,	May ...	14,910	,,
June ...	1,096	,,	June ...	17,867	,,
July ...	911	,,	July ...	14,617	,,
August ...	795	,,	August ...	13,020	,,
September	735	,,	September ...	11,020	,,
Total ...	5,081	,,	Total ...	81,514	,,

The price paid for milk here was 6d. for 10¼ lb. (*i.e.*, one imperial gallon). The employés are for the most part married women, who regard the summer as an opportunity for earning something towards the household expenses, or girls who are in service during the winter. The price of whey has slightly

increased from $\frac{1}{4}$d. per gallon to 6d. per 17 imperial gallons, a course which has been fully justified by results, as the farmers, who are obliged to take back 70 per cent. of the whey or be charged for it, are still glad to take it at the increased price. The spirit of co-operation has been well maintained, as will be gathered from the fact that the farmers continue to do all the carting to and from the station free of charge.

The following is a list of co-operative dairy, milk, butter-making, and cheese-making societies, with the addresses of secretaries :—

*1. Brandsby Dairy and Trading Society, Limited, Yorks.—The Secretary, Brandsby Dairy, Brandsby, Easingwold, Yorks.

*2. Eastern Counties Dairy Farmers' Co-operative Society.—The Secretary, 141, Fenchurch Street, London, E.C.

*3. Lampeter Dairy Society, Limited, Cardiganshire.—Mr. David Thomas, Lampeter Dairy Society, Lampeter, Cardiganshire.

*4. Newark Dairy, Limited, Nottinghamshire.—Mr. W. E. Frost, Long Bennington, near Grantham.

*5. Nidderdale Dairy, Limited.—Mr. E. Moorhouse, 6, Commercial Street, Harrogate, Yorks.

*6. Scalford Dairy, Limited.—Mr. W. H. Harper, The Dairy, Scalford, Leicestershire.

7. Skelldale Dairy, Limited.—The Secretary, Skelldale Dairy, Limited, near Ripon, Yorks.

8. Smeaton Creamery, Limited.—The Secretary, The Creamery, Great Smeaton, Northallerton.

*9. Vicar's Farm, Limited, Worcestershire.—Mr. Forster, Vicar's Farm, Far Forest, Rock, S.O., Worcestershire.

*10. Western Counties Dairy Farmers' Co-operative Association, Limited.—Mr. W. Johnson, 2, Cricklade Street, Swindon, Wiltshire.

*11. Wensleydale Farmers' Association, Limited.—Mr. W. Balderston, Bainbridge, Askrigg, R.S.O., Yorkshire.

*12. Sutcombe and District Agricultural Co-operative Society, Limited.—Mr. O. Greig, Thuboro, Sutcombe, Devonshire.

*13. Claro Dairy Society, Limited.—Mr. Samuel Mills, The Dairy, Arkendale, Yorkshire.

*14. Yorkshire County Dairy Farmers' Society, Limited.—Mr. T. S. Mason, 24, Station Parade, Harrogate.

[Those marked with an asterisk (*) are affiliated to the Agricultural Organisation Society.]

The secretaries of these associations would, doubtless, be glad to give further particulars to anyone interested in studying this most important development in greater detail.

H. C. FAIRFAX-CHOLMELEY.

THE NORTHERN ALLOTMENT SOCIETY.

This Society was established at Newcastle-on-Tyne on the 21st May, 1890. Its formation was the outcome of a series of public meetings held in the town and district with the object of furthering the growth of fruit and flowers and the cultivation of small holdings. These gatherings brought a number of people of similar aims into contact with each other, who, in turn, found it expedient to combine for the attainment of the objects they had in common. These objects were of a two-fold character, educational and practical; in other words, the Society which they then founded sought to extend a knowledge of the subject and to provide its members with facilities for reducing their knowledge to practice.

In order that no one should be debarred, membership of the Society was left open to the public upon one condition only—namely, that each member should subscribe to its funds a sum of one shilling per annum. The money thus obtained was applied to the outlay upon printing, postage and incidental items incurred by its officials. Apart from this condition, the Society, as a Society, has had no rules. Its officers consisted eventually of a Committee numbering twenty members, a Treasurer, and a Secretary, chosen from time to time, all of whom acted in an honorary capacity.

The Society has been instrumental in obtaining about thirteen acres of land in Newcastle, forming part of the Town Moor, upon lease, since converted into 144 allotments; has aided similar undertakings in the district from time to time, and founded a Bee-Keepers' Association, but its principal service has been to enable its members not merely to procure land in small quantities, which they could not do single-handed, but to procure it at a wholesale price. In discharging this service, its procedure has been of the simplest character. If at any time the officials learnt that an eligible estate was on the market either by public or private treaty, they took steps to have it considered and, if need be, inspected by the Committee, who, in turn, decided either that it was not suitable for the purpose of the Society, or that the matter should be placed before a meeting of the members for their consideration.

At this meeting, plans and particulars of the property were submitted, together with a report upon it by the Committee. If the estate was not entertained, a resolution to that effect was adopted and no further action taken. If entertained, an application list was opened, and any member could apply for whatever quantity he required. If a sufficient quantity of land was bespoken, the applicants were called together and their instructions taken to treat for the property, until it was either bought or the negotiations were abandoned.

It will thus be seen that a member of the Society, as such, incurs no liability beyond the payment of a subscription of 1s. per annum. For this sum he obtains information and opportunities, but is under no obligation to avail himself of them. If, however, a group of members form themselves into a body of purchasers they accept the entire responsibility for the undertaking, and determine exclusively every condition relating to the purchase, partition, and future user of the estate concerned.

The Society has now been in existence for fifteen years, and during this period it has promoted the purchase of thirteen estates directly, and one indirectly, containing in all 1,625 acres, at a total cost of £176,343 15s., in addition to which it has made abortive attempts to purchase a number of other properties. Of these fourteen estates, seven, containing 619 acres in all, have been allotted amongst the purchasers, and the remainder have been held as joint-stock properties, and developed by and on behalf of the proprietors.

A summary of the leading particulars of these estates, together with various details relating to their subsequent growth, is given on the next page.

In the treatment of these estates it will thus be seen that the Society has been the parent of a two-fold policy, due to the prevalence of occupying buyers in the one case and investors in the other.

Not having exacted from its members any confession of faith, the Society quickly drew into its ranks members who had no particular interest in its horticultural programme, but who saw in its agency a ready means of obtaining cheap land for residential purposes, for the investment of their money, or for the

Name of Estate.	Date Purchased.	Area. Acres.	Existing Houses when Purchased.	Population when Purchased Approximately.	Total Number of New Houses Built.	New Houses now Building.	Public Buildings	Total Population now.	Total Value of New Houses Built and Building and Public Buildings (approximate).	Number of Occupying Owners.	Remarks.
									£		
Red Cow (now Westerhope)..	1891	102	2	9	154	42	1	808	42,300	26	These Estates were allotted amongst the Purchasers.
East Denton ...	1899	41	none	none	none	none	none	none	—	2	East Denton Estate consists of Market Gardens Only.
Whaggs ...	1892	52	2	10	33	2	—	139	7,450	—	
Tethercock ...	1894	80	1	5	43	5	—	203	16,350	27	
Stocksfield ...	1895	210	9	50	77	3	—	280	40,000	45	
Smailes ...	1896	124	1	5	191	8	5	1,281	58,500	66	
Cleadon ...	1893	134	6	30	83	1	1	379	37,700	50	
Do. ...	1895	51	none	none							
Shotley ...	1898	123	5	30	8	—	—	33	3,030	4	
Stockton (two Estates) ...	1900	509	7	35	53	12	—	320	17,700	18	These are Suburban Building Estates.
Wingrove and Fenham ...	1898	123	6								
Fenham Hall...	1898	60	4	60	274	44	2	2,300	153,150	—	
Ashburton ...	1898	19	none	none	161	20	—	1,155	57,390	—	

extension of business in various directions. In effect, although not in name, the object of the Society has thus been broadened out, but it cannot be said that its original programme has suffered in consequence. On the contrary, the combination has been of mutual advantage. The horticultural member has preserved the same status and opportunities—indeed, his opportunities have substantially improved under the reinforcement. But for the residential and investing purchasers not one of the estates purchased under the auspices of the Society could at the time have been acquired; with their aid it became possible for the horticultural member to participate in an enterprise which otherwise he was too weak to handle.

In a district relying upon fruit and flower growing and market gardening as its staple occupation this condition need not apply, but Newcastle-upon-Tyne is not in that category, and the number of men in and about the town who are endowed with the requisite skill, experience and capital for embarking successfully in this line of business as a means of livelihood is strictly limited. The demand for their produce is, however, very substantial, not to say enormous, and therefore the Society has been, and to a greater extent should continue to be, a useful factor in planting men of this class upon their own freehold, under the best practicable conditions. On the other hand, the investing member has found that his residential and horticultural colleagues have become the nucleus of a new colony, and that their immediate occupation of the land has had a wholesome effect upon his investments. The blending of these various interests has, furthermore, brought into the community a wider intelligence, which has been of great practical value, a higher taste, and better methods of, and facilities for, transacting business.

Whether a given estate was to be owned collectively or allotted amongst the purchasers was determined by the purchasers themselves, if need be, by a vote of the majority, with the result already stated, that seven have been treated in the one way and seven in the other.

The proprietary estates have, with one exception, been owned by limited liability companies, due primarily to the fact that the purchasers in each case numbered more than

nineteen persons and could not otherwise sue or be sued collectively.

The policy of these companies has, however, been to a considerable extent leavened with a determination to lay out their property on a liberal scale. In all these cases, more or less extensive steps are being taken to banish the conventional treatment of a building estate under which a maximum number of human beings are crowded on to a given area of ground.

The remaining estates have been parcelled out amongst the purchasers in accordance with conditions fixed by themselves before entering upon a contract to purchase. These conditions were embodied in deeds of mutual covenants. These deeds define the process by which each subscriber was to become the proprietor of his allotment, and the conditions under which it should in future be held. The deed further provides for the execution of whatever collective work of an initial or permanent character had been agreed upon, such as the construction of roads, paths, and bridges, the provision of water supply, redemption of tithe, quit rents, and land tax, reservation of common land for quarries, sand pits, or other purposes, approval or otherwise of building plans, and the future maintenance of any common responsibility or privilege. Briefly stated, the parties concerned covenanted to allot the estate amongst themselves by mutual agreement, or failing that, by private auction.

For this purpose the estate was laid out in lots each containing the greatest common measure of the acreage required by the applicants, generally one acre, each lot being provided with road frontage, existing or new. The total estimated cost of the estate, that is, the purchase money paid to the vendor plus the estimated cost of the new roads, roadside fencing, surveying, legal and secretarial work, and any other service of a collective character, was then apportioned over the lots comprising the estate by an independent and competent valuer, regard being had to the relative position of each lot, proximity to railway station, aspect, soil, &c. Each allottee was furnished with a copy of this valuation, and the valuer's notes upon the character of the ground were placed at his disposal, so that an inexperienced

buyer had the benefit of his guidance. Failing a mutual agreement under which the allottees appropriated the several lots, without overlapping, at the valuer's figures, the lots were put up to auction amongst the allottees, and knocked down to the highest bidders. No bid was valid below the value fixed by the valuer, so that the total amount required was assured, whilst any premiums paid at the auction went into the common fund. If, after the whole of the collective work had been discharged, any surplus remained, it was returned as a bonus to the allottees according to the cost price of their property. Conversely, if any deficit was incurred, it was levied upon the same basis.

A bidder having more than one acre had the option of taking the adjoining lots, on terms, so that he could obtain all his land in one parcel. In examining the provisions of the earlier deeds it is to be borne in mind that the parties to them were, at the outset, pioneers, that no undertaking of a similar character was known to them, nor had they the benefit of any special training or knowledge of estate management. The lessons of experience are to be found in the later documents, notably in the provision of wider and better roads, uniform fencing, more careful control over the character of the dwelling-houses erected, and a more stringent regulation of the uses to which the land might be put.

Room for improvement no doubt exists. A hostile critic looking at these new villages as they stand to-day can readily espy something amiss, in his opinion; he would have put down a superior house or road, have cultivated the land better, have planted more trees and hedgerows, have preserved the estate from this or that eyesore. No one is more alive to the defects in development than those most concerned, but if any defence is needed, it is to be said that they tried to make the best of their opportunities with the resources at their command. A group of idealists with unlimited cash at their disposal might have done better, or they might not; but the idealists in this case have been yoked together with hard utilitarians, and the outcome may be taken as the best available compromise.

It may be added that thirty-four members of the Society recently offered to purchase an estate of 633 acres near New

castle, which they had decided to allot among themselves, but it was somewhat abruptly sold to another party, although the former were within 2 per cent. of the requisite purchase money. It may be taken as evidence of an improved policy that the following proposals were contemplated in the event of a purchase :—

1. To pay a premium to the first ten allottees who built a dwelling-house on their land. In the absence of this provision the pioneer builder would enhance the value of his neighbour's property without participating, whilst the latter might sell out at a profit which he had not created.

The payment of a premium would tend to equalise their positions and to hasten the residential occupation of the land.

2. To make provision for the collective enforcement of the remedies against any breach in the building covenants or user.

In the absence of this precaution the responsibility would rest upon any one aggrieved owner, who might be unable to take action at his own cost, although his action was, rightly considered, conducive to the interests of the whole community.

3. By subsidy or otherwise to provide means of conveyance daily between the estate and the nearest railway station, and to charge the cost for a period of ten years upon the whole estate, thus making every proprietor contribute, whether he used the service or not, upon the ground that it tended to popularise the whole estate and to enhance the value of his property.

Looking broadly at the position of the Society and its influence upon the life of the district, it is to be said that its policy has here and there engendered hostility of a transitory character, but that in the main its objects have met with public approbation. Its members have generally enjoyed friendly relationship with local governing bodies, but have obtained no favours at their hands nor one penny of ratepayers' money. They have, however, occasionally suffered the oppression of urban bye-laws administered without discretion in a rural neighbourhood.

The Society has, of course, enjoyed no compulsory powers under which its members could select ideal estates, but has made the best of the exigencies of the landlords upon a generally hard market. It has, however, provided allotments and small holdings upon more advantageous terms than were hitherto possible in the district, promoted a considerable exodus of solvent families from the town to the country, expended a very substantial sum upon house-building, road-making, tree-planting, and other estate work, created thriving villages, having in their train new churches, chapels, schools, and public institutions, extensions of gas and water supplies ; increased rateable values ; provided a market on the spot for country produce, and a more active demand for country labour, and has provided for its members and others concerned opportunities for improving their position in life which otherwise were not open to them.

In this connection it should be added that in several cases systems of sewage disposal have been entailed upon the districts affected, in spite of a preference on the part of various proprietors concerned for a more primitive treatment of domestic refuse.

Reports upon the Society's work have appeared from time to time in various newspapers, and have led to enquiries from correspondents throughout the country, from which it is evident that the interest in the subject is widespread, and might, with public advantage, be turned into practical channels.

Although dealing with a problem which has engaged the attention of politicians of every hue, the Society has no political colour nor connection with any political organisation.

Its members hold diverse views upon political issues, and do not as a body attempt to influence the course of legislation. They leave this work to the politician, and in the meantime make the best adaptation they can out of the existing situation.

Joseph W. Wakinshaw.

Agricultural Credit in Hungary.*

Hungary is a country which is essentially agricultural, some 68 per cent. of the population being engaged in, or dependent on, agriculture and its allied industries. The total area is nearly 81 million acres, of which 76 millions is classed as land under cultivation, including, however, over 22 million acres of forest. Looking at the distribution of the farm land according to the size of the holding as shown in the following table, it will be seen that large, medium and small farms are well represented :—

Size of Holding.	No. of Holdings.	Area in Acres.	Average Area in Acres.
Up to 7 acres	1,459,893	3,646,700	$2\frac{1}{2}$
From 7 to 143 acres ...	1,311,218	28,763,000	22
From 143 to 1,430 acres ...	20,797	8,447,000	406
Over 1,430 acres	3,977	18,517,000	4,655

Passing over the first of the categories given, which in a large number of instances are merely allotments, the small farms, with an average area of 22 acres each, account for nearly one half of the cultivated surface ; the third division, described in the official statistics as "medium farms," represents about 14 per cent. of the farmed area, while the areas worked in holdings of nearly 1,500 acres and upwards cover no less than 31 per cent. of the agricultural land. From these large estates, which form one of the typical features of Hungarian agriculture, came, as might be expected, the earliest movement in the direction of providing loans for agricultural purposes, when in the year 1862 the needs of the great agriculturists and landowners led them to form the National Land Bank (Boden Credit Institut). According to the first of its Articles of Association,† the object is to procure safe credit for landed property, the owners of which are associated in mutual and unlimited liability. A guarantee fund of £140,000 was subscribed by 209 "founders," who took shares of 5,000 florins (£417), 10 per cent. being paid

* See also articles on Agricultural Credit Banks, May, 1905 ; Agricultural Credit in France, June, 1905 ; and Village Banks in England, June, 1905.

† See Land and Agricultural Banks. H.C. 115 of 1898.

in cash and the remainder in nine bonds. These nine bonds were to be returned to the founders as the reserved fund increased, but the sum paid in cash was retained and bore interest at 5 per cent. Loans are granted either in cash or in "land mortgage" debentures to ordinary members, *i.e.*, borrowers whose land provides a minimum security of 1,000 florins (£83). These debentures bind the bank to pay the holder the principal and interest, but the holder cannot require payment at any given time. They are secured not only by the foundation capital and by the mortgages against which they are issued, but also by the mutual and joint liability of the members. They form, therefore, a marketable security which can be passed from hand to hand, and the aggregate loans of the bank up to the end of 1903 had amounted to £27,600,000. The majority of the loans are for sums exceeding £4,000. In the Parliamentary Report above referred to, it is pointed out that this bank is not a joint-stock or dividend-earning bank, but a mutual association of proprietors on the principal of unlimited liability as regards the ordinary members, while the founders, being philanthropic and patriotic in their aims, contented themselves with—for Hungary—the very moderate fixed interest of 5 per cent. on their paid-up capital (one-tenth of their guarantee).

The success of this bank was so marked that in 1879 another similar Land Credit Bank was formed on the same model for small proprietors, bearing the name of the Small Farmers National Land Credit Bank. From a note* on the subject by Count Joseph Mailath, it appears that the State endowed the bank with a loan of one million crowns (£42,000) free of interest. The balance of the capital was made up, as in the other case, by shares (upon which interest was limited to 5 per cent.) taken up by "founders." The lowest loan to be made was £25, but this was reduced by one-half in 1902. The bank had at the end of 1903, £2,300,000 outstanding on mortgage. One-half of these loans are under £80, and only very few exceed £200.

Apart from these institutions, a number of co-operative credit banks have been in existence in different parts of the country

* Report of Sixth International Co-operative Congress, Budapest, 1904.

for many years. Many of these were based on the Raiffeisen system. In 1898 an attempt was made to control the work by a law which provided for the establishment of the National Central Credit Co-operative Association as a capitalising centre for those co-operative associations which complied with its provisions. Under the new law co-operative societies may be formed only subject to the approval of the authorities, or of some public institution, such as the Agricultural Society, the Chamber of Commerce and Industry, or with the co-operation of the Central Credit Bank. Their operations are to be confined to their own parish or some similar area. Interest on capital is limited to 5 per cent., and members' liability for their society is extended to five or ten times the value of their share. As an inducement to associations to form themselves under this law privileges were offered, consisting of tax and stamp exemptions and advantages in validating claims.

The foundation capital of the National Central Association was raised by its founders, and by the co-operative associations affiliated with it as ordinary members. The founders, viz., the Government, some corporations, and private persons, brought as their share £174,250, and the associations as regular members £32,700. The State subscribed £42,000, and by reserving to itself the appointment of the president and some other officers, as well as permanent supervision by a Government Commissioner, it exercises a controlling influence. The King also took shares to the value of over £2,000. The first Report of the Association explains briefly its method of working: The members of the affiliated co-operative associations obtain loans by promissory notes or bills, and if the associations are unable to meet the demands from their own capital and from deposits, they obtain the necessary money by indorsing the bills and assigning them to the Central Association. The money resources of the Central Association, in addition to the foundation capital consist of State and savings deposits of about £475,000 in value the sale of interest-bearing bonds issued under legal authority amounting to about £480,000, and finally, the re-discount of bills. Count Mailath explains that these interest-bearing bonds may be issued in return for the promissory notes which the Associa tion holds from members of local banks, brought to it for dis-

count by those banks. Such bonds are negotiable instruments and find a ready market. To secure these bonds the law requires that the bank should raise a special guarantee fund of £125,000 to be added to by the addition each year of 10 per cent. of the accrued profits. In no case is the guarantee fund to fall short of 10 per cent. of bonds in circulation. Not to embarrass the bank at starting, the State itself provided the first funds of the guarantee fund, laying down £125,000 in Government bonds.

The number of societies which up to the end of 1903 had taken advantage of the law and affiliated themselves to the Central Association was considerable, as will be seen from the following figures taken from the *Annuaire Statistique Hongrois*, 1903.

No. of societies	1,653
No. of members	366,721
No. of shares	700,273
Share capital	£1,418,000
ditto (paid up)	£714,000
Savings deposits	£883,000
Reserve fund	£95,000

It appears from this that the local societies average about 222 members who hold nearly two shares each, the average value of the shares being £2. The interest charged on loans by the local societies is generally 7 to 8 per cent.—a rate which is not considered high in Hungary—and it is stated as an evidence of their satisfactory condition that they are becoming more and more capable of providing for their needs out of their own resources, and, accordingly, come to the Central Bank for fewer loans.

The Central Bank itself not only provides money, but also cts as organiser and controller of the local societies, and advises the Government on co-operative matters.

The local societies shown in the Table above do not by any means represent the whole of the credit associations in the kingdom of Hungary, as the total number in 1903 was 2,830.

Cleansing of Water-courses.

A deputation from the Central and Associated Chambers of Agriculture waited on the President of the Board of Agriculture and Fisheries early in the present year for the purpose of drawing the attention of the Board to the damage stated to be caused by the neglect of certain occupiers of land to keep clean the channels of water-courses and streams running through their land. The deputation suggested that the law which deals with this subject was very little known, and that it might be useful if a short summary of the legal position could be published in this *Journal.*

For mere omission a man is not, generally speaking, answerable by law; and accordingly, at common law, the occupier of land through which a water-course runs is not, as a rule, under any obligation to neighbours whose lands drain into that water-course to prevent or remove any obstruction of the outfall due to merely natural causes (such as silting up of the channel or growth of weeds), and not caused by any action on his part, though, in exceptional cases, *e.g.*, under an inclosure award, such an obligation may sometimes exist.

A statutory remedy is, however, provided by the Land Drainage Act, 1847 (10 & 11 Vict., c. 38), irrespective of any existing legal obligation on the part of the occupier of the land; but the statutory duty imposed by this Act arises only on notice given by the person injured, and the Act does not create any liability in damages for the injury caused by the occupier's neglect.

Section 14 of the Act enacts that where, by the neglect of any occupier to maintain or join in maintaining the banks, or to cleanse and scour or join in cleansing and scouring the channels of existing drains, streams, or water-courses lying in or bounding the lands of such occupier, injury is caused to any other land, the proprietor or occupier of any land so injured may serve a notice on the neglecting occupier requiring him to maintain the banks or cleanse or scour the channels in question. If he neglects so to do, the occupier of the land injured may, after one calendar month from the service of the notice, carry out the necessary work. The cost of the same or a just proportion

thereof is to be paid by the neglecting occupier, and payment may be enforced by an order of justices.

Section 15 provides that, unless the drain, stream or watercourse to be cleaned bounds or immediately adjoins the land of the occupier injured by the neglect, a justices' warrant to enter on the defaulter's land in order to carry out the necessary works must be obtained. This warrant is to be granted if the justices are satisfied that the injury has been caused by the neglect of the occupier whose land is to be entered.

Threshing of Barley.*

Complaints are frequently made by brewers and maltsters of the injury done to barley in the process of threshing, owing to the fact that the drum of the threshing-machine is set so close that many of the grains are chipped or broken. The presence of these injured grains greatly deteriorates the value of the barley for malting purposes, as the broken, bruised or skinned grains fail to germinate, and soon show signs of mould, thus leading to unsoundness in the malt and bad results in the brewery. The injury caused by over-dressing is not limited to those grains which are cut in halves; grains closely nipped at one or both ends, or such as have been bruised and peeled, are equally objectionable. In fact, if by too vigorous threshing the husk of the barley is damaged, although the damage may not be apparent, irregularities in the malting, accompanied by the production of mould, are likely to result.

When farmers commence a day's threshing, therefore, they should at the outset, and repeatedly during the day, carefully examine the grain. If any signs of injury are observed the drum of the machine should be slightly opened. It is better that part of the beard should be left adhering to the grain than that any risk should be run of injuring the reputation and value of home-grown barley through having broken and chipped grains.

* This article will be reprinted as a leaflet (No. 149), copies of which can be obtained on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.

In this connection it may be useful to reproduce some observations by Mr. Hugh Baird on the importance of careful adjustment of threshing-machines, which appeared in the *Journal* of the Highland and Agricultural Society in 1902. Mr. Baird pointed out that if in order to get all the grain out of the ear, and especially when the barley is difficult to thresh, the drum and concave are set too close, there is obviously more danger of breaking and "nibbing" than when they are not so closely set.

A new machine will break the grain more than after it has been used for a time and the roughness of the beaters has been worn off. On the other hand, when a machine has been much worn, the centre of the drum and concave having had the most work, in consequence of the feeding being necessarily more in the centre than at the ends of the drum, the space or distance between them is greater in the centre than at the two ends, and if they are set to thresh clean in the centre they will be too close at each end, and consequently breaking will occur. This fault can only be remedied in putting on new drum-beaters and concave ribs.

Great attention should also be paid to regularity of feeding. The engine should be driven at an even speed, and proper care should be taken over the adjustment of the several parts of the machine.

It is not only in the drum of a threshing-machine that unnecessary damage to the kernel takes place through imperfect setting of the several parts, but also in the barley-awner, through which the grain subsequently passes. Here, if the beaters are set too closely, and the barley is roughly handled, "nibbing" will take place. Different lots of barley require different treatment, so that those in charge of the threshing should make a point of constantly examining the sample, and if it is found to be injured in any way, they should ascertain in what part of the machine the injury occurs, and should alter the setting until it is remedied.

Notes as to Foreign Crop Prospects.

France.—The French Ministry of Agriculture published on the 20th June last their estimate of the area and condition of the principal corn crops based on reports made on May 15th. The area under each crop is given as follows:—

	1905. Acres.	1904. Acres.
Wheat	16,049,000	16,149,000
Mixed corn	373,000	391,000
Rye	3,136,000	3,206,000
Barley	1,785,000	1,741,000
Oats	9,415,000	9,471,000

Rather more than one-half of the wheat crop is returned as 'good" and the remainder as "fairly good." The condition of the bulk of the barley crop is regarded as "good," and this is also the case with about 60 per cent. of the oat area.

Germany.—The condition of the crops in Germany in the middle of June, according to the official reports, was, with the exception of clover, equal to, or in some cases rather above. the average at the same time during the past twelve years. In many districts the winter-sown crops, especially rye, have suffered from frost, dryness, weeds, &c., but generally they have developed satisfactorily, and promise a fairly good crop. The condition of the crops is indicated numerically (2 = good, 3 = average) as follows:—Winter wheat, 2·3; spring wheat, 2·5; winter and summer rye, 2·3 and 2·5; spring barley, 2·5; oats, 2·6; and potatoes, 2·5.

With regard to potatoes, it is stated that late sowing, cold and drought and occasionally defective seed, have caused this crop to come up irregularly; it is hoped, however, that the advent of warmer and moister weather will soon cause an improvement, as at the time of the report potatoes were only in the first stage of their growth.

Hungary.—The yield of wheat in Hungary (excluding Croatia and Slavonia) is semi-officially estimated on the basis of the returns published by the Ministry of Agriculture at 156 million bushels as against 137 million bushels last year and 162 million bushels in 1903. The prospects of the corn crops generally are regarded as satisfactory.

Spain.—A considerable deficiency in the wheat crop is

reported from Spain. According to an official report of the 1904 crop, published by *Dornbusch*, June 7th, the yield of that year is put at 94,800,000 bushels, which is considered to be below the requirements for consumption and seed. In consequence of the drought it is feared that this year there will be a large deficit.

Russia.—According to an official report, communicated by the British Commercial Agent in Russia, the condition of the crops in European Russia on June 23rd was as follows:—Winter wheat, near the average; spring wheat, satisfactory with the hope of a yield above the average; rye, variable and on the whole below the average; oats and barley, gave promise of more than an average crop.

United States.—The area under winter wheat on May 1st was 29,723,000 acres, and of spring wheat on June 1st, 17,613,000 acres, making an estimated acreage of 47,336,000 as against 44,075,000 acres in 1904. The average condition at the beginning of June of the winter wheat was 85·5 compared with 77·7, and of spring wheat 93·7 compared with 93·4 at the same time last year. The condition of oats and barley was rather above the average.

Argentina.—The preliminary official estimate of the current year's crop (already harvested) is 4,200,000 tons as against 3,579,000 tons in 1904. Deducting from the production 1,700,000 tons for consumption and seed, the balance available for exportation is 2½ million tons. The maize harvest is expected to produce 3,600,000 tons, and the quantity available for export will be about the same as last year.

India.—The area under wheat in 1904, viz., 28,414,000 acres though not a record, was the highest of the decade, being about 5 million acres greater than in the preceding year, and the area of 28,232,000 acres in 1905 shows a fall of less than 1 per cent. The yield, however, has diminished by about 2,100,000 tons, or nearly 22 per cent., from 9,601,000 tons in 1904 to 7,520,000 tons in 1905. In making comparisons with 1904 it must be remembered that the yield of that year was abnormally prolific, exceeding any previous record by 1,600,000 tons, and this year's out-turn of 7½ million tons is still well above the average.

Experiments with Varieties of Oats.

Experiments with oats were carried out in 1903–4 by the Morayshire Farmers' Club in co-operation with the Department of Agriculture of the University of Aberdeen.

The growing of oats is an important feature of Morayshire farming, and these experiments were organised with the purpose of assisting the members of the Morayshire Farmers' Club to choose among the recently introduced varieties of oats those most suitable for local circumstances. The southern seaboard of the Moray Firth grows oats of fine quality, much in demand for seed and milling, and probably in few parts of Scotland is a larger proportion of grain sold off the farm. The trials were carried out on three farms selected to represent three types of soil common in the Moray lowlands, and the season was favourable except at one place, which suffered from the excessive rainfall. The crops were secured in good condition on all the farms.

The table below shows the average quantity of total grain, the average quantity of dressed grain, and the percentage of light grain for each variety.

Variety.	Average Quantity of Total Grain. Bushels of 42 lb.	Average Quantity of Dressed Grain. Bushels of 42 lb.	Percentage of Light Grain to Total Grain.
	Bushels.	Bushels.	Per cent.
Banner	88	83	5
Goldfinder	85½	81	5
Siberian	85	79¼	6
Newmarket ...	81½	77½	4
Waverley	80¾	75½	6
Storm King ...	76¾	72¼	5
Potato	72	63¼	12
Sandy	63¼	50¾	19

Banner produced 32 bushels more of first quality grain than Sandy, and 20 bushels more than Potato. The superiority of the "new" varieties is clear, but shows better when the dressed grain only is considered. In other words, the new varieties give a larger proportion of good grain as well as a heavier total yield. There is little to choose between Waverley and Newmarket, nor between Siberian and Goldfinder. Although differences in the soil at the different farms had, apparently, little effect on the relative production of the varieties as regards grain, this was not the

case with the straw, as there were considerable variations in the yield of straw at the three centres.

Three points were apparent from the returns of the yield of straw and grain: (1) Potato produced the greatest weight of straw; (2) Siberian proved a good general purpose or intermediate variety, and the same may be said of Newmarket; (3) Banner, the best grain producer, was in no instance the worst straw producer.

A comparison in terms of money value is not altogether accurate, but assuming, for the sake of comparison, similar values for similar weights, and that the dressed grain is worth 18s. per quarter, and the straw 40s. per ton for feeding, the order of total value of produce is as follows:—

	£	s.	d.
Goldfinder	14	3	7
Banner	13	8	4
Newmarket	13	4	5
Siberian	13	3	6
Waverley	12	12	10
Storm King	12	8	10
Potato	12	3	2
Sandy	10	3	10

Experiments were also carried out by the Agricultural Sub-Committee of the County Council of Ross and Cromarty on the same lines, and organised for the same purpose as those conducted in Morayshire. With one exception (Hamilton substituted for Siberian) the same varieties were tested, but owing to various causes the result of the trials in Ross and Cromarty are not strictly comparable with the Morayshire results.

In Morayshire the season was drier, and the harvest weather almost all that could be desired, but in Ross-shire, where the crops on all the plots were heavy and long in the straw, rain and wind before and after cutting introduced new openings for unreliable results. Many of the plots were lodged and twisted, making cutting difficult and the produce of straw impossible to estimate. Again, the stations were far apart, and suffered bad weather in varying degrees. In view, therefore, of the abnormal character of the year, 1903, the results obtained at each station are considered separately in the Report. Taking, however, the relative money value of each variety at each farm, the results were as follows:—

Variety.	Navity.			Rosehaugh.			Davidston.			Ballach-raggan.			Average.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Waverley	13	17	3	14	3	0	13	12	0	13	4	9	13	14	3
Hamilton	12	13	0	13	5	6	14	4	0	13	11	9	13	8	7
Potato	11	7	6	16	13	9	11	4	0	13	6	0	13	2	10
Sandy	10	17	9	15	12	9	12	11	6	13	7	0	13	2	3
Newmarket	11	17	9	15	10	0	11	8	6	12	18	6	12	18	8
Banner	9	0	0	14	2	9	12	11	6	13	4	9	12	4	9
Storm King	9	15	0	16	16	9	11	2	3	9	4	0	11	14	6
Goldfinder	10	6	6	11	7	3	11	16	0	12	8	6	11	9	7

On the whole the popularity of the old-established strains—Potato, Hamilton, and Sandy—in such years as 1902 and 1903 is considered to be justified. By a process of selection the varieties that best withstand the frequent adverse climatic conditions have been retained, and the old strains are the progeny of these; incapable of responding freely to favourable seasons, but hardened to low temperatures and able to mature in a deficiency of sunlight.

The new varieties, on the other hand, are frequently the result of crosses with foreign oats of delicate constitution, or the progeny of direct importations from sunnier and hotter climates. Banner is an example.

Nevertheless, there is no doubt that in many cases the "new" varieties are far more valuable than the "old." Even in 1903 Waverley was, in total money value of crop, superior to any older strain. It remains to discover under what conditions they will prove more profitable and how they may be still further improved.

The Report concludes with the observation that a variety experiment is easily made, and may prove of the greatest value to the experimenter. The difference in value between one variety and another is often more than the rent, and the cost of discovering the difference is chiefly the trouble of weighing the produce on a selected area. There is no sure test but the weighing machine. Nothing is easier than to misjudge two crops of oats of different kinds. In Morayshire, when the growing crops were inspected, Siberian was generally put in the lowest place, but the weighbridge proved it the second best.

Experiments extending over a number of years have been conducted by the Ontario Agricultural College, for the purpose of testing the difference in the crop obtained from large, medium, and small seed. Fresh seed has been taken each year from the general crop of grain grown either in the Farm or in the Experimental Department. In the selection of large plump seed, half-a-pound was carefully weighed from each kind of grain. The number of large plump seeds was then counted, and a corresponding number was taken of the medium-sized and other grain. The different selections were sown upon plots of similar size. The average results are as follows :—

Comparative Yields of Large and Small Seed.

Description of Grain.	No. of Years that the Tests have been Repeated.	Description of Seed.	Weight of Grain per Measured Busnel. lb.	Average yield per acre (from 6 to 9 years).	
				Tons of Straw.	Bushels of Grain by Weight.
Oats ...	7	Large seed ...	33·2	1·9	62·0
		Medium sized seed	32·2	1·8	54·1
		Small seed ...	31·8	1·8	46·6
Barley ...	6	Large plump seed	49·5	1·5	53·8
		Small ditto ...	48·8	1·5	50·4
		Shrunken seed ...	49·1	1·4	46·0
		Broken seed ...	48·6	1·3	43·2
Winter wheat	6	Large plump seed	59·4	2·6	46·9
		Small ditto ...	59·2	2·2	40·4
		Shrunken seed ...	59·1	2·1	39·1
		Split seed	54·2	·6	9·3
Spring wheat	8	Large plump seed	59·1	1·4	21·7
		Small ditto ...	58·3	1·3	18·0
		Shrunken seed ...	56·9	1·2	16·7
Peas ...	6	Large seed ...	56·3	1·3	28·1
		Small seed . .	56·3	1·1	23·0
	9	Sound seed ...	58·1	1·4	29·2
		Split seed	57·9	·6	10·2

In the average of seven years' experiments, large oats produced about 8 bushels per acre more than medium-sized seed, and an average of 15½ bushels per acre more than small seed. Large plump barley gave a yield of nearly 8 bushels per acre more than that produced from shrunken seed in average results for six successive years.

Split peas and broken wheat gave exceedingly poor results; broken barley gave 10 bushels per acre less than the large plump seed.

For eleven years in succession an experiment has also been conducted in breeding oats by means of selection. Three grades of oats were chosen, viz., (1) large, plump, well-developed seeds, (2) light-weighing and light-coloured seeds, and (3) seeds from which the hulls had been removed. The test was commenced in the spring of 1893, by selecting seed from the general crop of Joanette oats of the previous year. The selection made in each of the following years has been from the product of the selected seed of the previous year. The number of grains used on each plot was carefully counted, and an equal number was used of each description each year. In the crop produced in 1903, it was found that the large plump seed produced 76·9 bushels; the light seed 57·7 bushels; and the hulled seed 72·2 bushels per acre. Only the best quality of seed is hulled, and it will be seen that it gave nearly as good results as the carefully-selected large seed. In weight per measured bushel, the crop produced from the large plump seed weighed $7\frac{1}{2}$ lb. more than that from the light seed, and about one-third of a pound more than that from the hulled seed. The difference throughout between the large, plump, well-developed seeds and the light-weighing and light-coloured seeds is very marked, and shows the great importance of sowing the former and discarding the latter. It is interesting to notice that the crop produced from the large plump seed required only 1,208 grains to weigh an ounce, while the crop produced from the light seed required 1,586 grains to make the same weight.

Sampling of Seeds Imported into the United States.

The United States Treasury Department, at the instance of the Secretary of Agriculture, have directed that for one year, from July 1st, 1905, 2-oz. samples of all importations of 100 lb. or more of grass, clover, and forage-plant seeds be prepared at the earliest practicable date after entry, and forwarded to the Seed Laboratory Department of Agriculture, Washington, labelled with names and addresses of consignors and consignees, name of seed as given in the invoice, and quantity of the consignment.

Testing Agricultural Seeds.

Seeds for use on farms and market gardens should always be bought subject to a guarantee of purity, genuineness, and high germinating power. Purity may be taken to mean that the seeds composing the sample consist of the variety required without admixture of other seeds, or of sand, dirt, chaff, empty husks, &c. Impurity is usually caused by carelessness in separating weed seeds from the bulk and from want of care in cleaning and screening, and is one of the most important considerations in purchasing seeds, as impure seed is the cause not merely of a diminished yield, but is responsible for the spread of weeds. Farmers not infrequently make use of the sweepings of haylofts, and thus encourage the reproduction of weeds, which later in the season require much labour to be prevented from choking the cultivated crop. An example of the extent to which weed seeds may be present in home-grown seed (not sweepings) was mentioned in an article in this *Journal* (July, 1904) on the "Destruction of Weeds." In this case two samples of home-grown clover seeds were sent before use to the Botanist of the Royal Agricultural Society for examination, and were found to contain in one case only 53 per cent. and in the other case 45 per cent. of seed true to name. The number of weed seeds, moreover, which may occur in a pound of seed, which is only slightly impure, is considerable. In some samples tested in the United States, one which contained less than 1 per cent. of impurity had about 3,000 weed seeds to the pound; while in another sample in which 2½ per cent. was spurious seed, there were more than 27,600 weed seeds. The number of weed seeds sown to the acre would be enormous, and, having an equal chance with the crop among which they grew, might be the cause of considerable loss. The presence of 1 per cent. of dock seed in a mixture of grass and clover seed for ordinary leys means ten or more dock plants per square yard all over the field where it is sown.

In addition to the guarantee of purity, a high percentage of germination should be demanded, and the germinating power of the seeds may usefully be tested to see whether they come up to the standard named. Persons who are members of certain agricultural societies may have this done and the purity tested for a small fee. Tests of a similar character are carried out at

the Aynsome Seed Testing Station and by one or two of the agricultural colleges. Some of the agricultural newspapers also make arrangements for seed testing on behalf of their readers.

Attention was drawn in the April number of this *Journal* to the provisions of the Adulteration of Seeds Acts in regard to killed or dyed seed, &c.

Cultivation of Lucerne.

Lucerne (*Medicago sativa*) is a crop which has been increasingly cultivated in several counties of England during the past ten years. In 1894 the area in Great Britain was under 22,000 acres, whilst ten years later, in 1904, it was 55,700, and in the preceding year it had exceeded 60,000 acres. It is chiefly grown in the Eastern, South-Eastern, and Midland districts, the largest areas being in Essex (14,661 acres), Kent (11,946 acres), Suffolk (4,568 acres), Hertford (3,285 acres), and Cambridge (2,271 acres), while Bedford, Berks, Bucks, Hants, Lincoln, Norfolk, Northampton, Oxford, and Sussex each had over 1,000 acres in cultivation in 1904.

As was stated in a previous article* on the subject, it is essentially a crop for dry climates and dry soils, and its cultivation has been most successful in countries where those conditions prevail. It is very largely grown in Argentina and in the irrigated districts of the United States, where it is now cultivated almost to the exclusion of other forage plants. It is also grown on a large scale in France and to a considerable extent in Germany. There are many districts in this country, however, in which it thrives and where it forms a useful fodder crop for the farmer, and it is interesting to note that in the United States at the present time the growth of lucerne is extending northward and eastward, and it is found that it can be acclimatised in many regions where it has not hitherto been commonly grown.

In a bulletin recently published by the United States Department of Agriculture it is stated that it grows best in a well-drained, loamy soil, with a subsoil sufficiently open to allow the

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* *Journal*, Vol. IX., p. 343, Dec., 1902.

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roots to penetrate to a considerable depth. An excess of water, however, is very unfavourable, and it is essential that the soil should be fairly fertile and free from weeds. The latter condition is important, as the young and tender plants are easily crowded out when they first come up. The cultural directions given for the States agree generally with those recommended for this country in the article before referred to, and may be summed up by saying that it is advisable to get the land in clean condition for sowing by the growth of a fallow crop which should be heavily manured and carefully cleaned. The seed is usually sown in the spring, at the rate of 20 lb. per acre when sown broadcast, or about 15 lb. if sown with a drill and well harrowed. It is best sown alone, but it is customary in many localities of America to sow it with grain, and if the conditions are well suited to the growth of lucerne the stand may not be materially injured. Barley is used for this purpose, and the sowing must be comparatively light so as not to smother the lucerne.

If the seed is drilled, the land can be kept clean by hand or horse-hoeing, and one or two cuttings may be obtained in the first season It is, however, said to be important not to cut it too late in the autumn. It should have a good growth—at least six inches high—before the advent of severe weather.

Lucerne does not usually reach its maximum development until the third or fourth season, but no treatment is necessary after the first season except to cut the hay at the proper time. In America it is regarded primarily as a hay crop, though it is also used for pasturage and feeding green to stock. It should be cut just as it is beginning to bloom. After the beginning of the flowering period the hay deteriorates rapidly in nutritive value. If the field is fairly uniform, the proper stage for cutting is when about one-tenth of the plants have reached the flowering period. The harvesting should take place with as little handling as possible, in order to prevent shaking off the leaves, which contain a large proportion of the nutriment. The fields are usually used to some extent for pasturing, but this must be done with caution, as cattle and sheep are liable to become "blown," and they also cause injury to the field by treading the plants. For grazing purposes better results may be obtained by combining lucerne with grass and clover seeds. Pigs do well on lucerne,

and from fifteen to twenty-five pigs may be kept per acre; though it is not absolutely necessary, they have been found to give the best results when receiving in addition some maize or other grain.

Lucerne, either in the form of hay or in its green state, is a very nutritious and palatable food for all kinds of farm animals. It is more nutritious than clover, but on account of its high percentage of protein it is not a well-balanced ration, and should be combined with some other food which is rich in carbohydrates, such as maize or barley.

In common with other leguminous crops, lucerne has the power of gathering nitrogen from the air, and thus adds to the fertility of the soil on which it is grown. Not only does the soil become richer in nitrogen, but other mineral constituents are made more available because of the penetrating power of the roots of this plant, which extend to a great depth and bring up mineral supplies from the subsoil.

Experiments on the Seeding of Pastures.*

The West of Scotland Agricultural College have recently published a Report by Professor M'Alpine on experiments on the seeding of pastures carried out in 1901–1904. The object of the experiments, which were conducted on plots of one-tenth of an acre at seventeen farms, was to ascertain the composition of a first-class seed mixture for one year's hay and two or three years' pasture. It is pointed out that the first requirement is a good hay crop for the first year —a crop of maximum weight and nutritive value. A second requirement is good pasture after the hay—pasture which the stock relish, and on which the maximum stock may be kept. A third requirement is that the grass should, as far as possible, keep down weeds—such as Yorkshire fog and bent—and should leave the land clean for the succeeding crops. The fourth requirement is that the land should, as far as possible, be enriched by the pasture, and so be more favourable for succeeding crops.

The ingredients used for making up a grass mixture may be

* See "Use of Rye-Grass in Seed Mixtures," *Journal*, May, 1904, Vol. XI., No. 2.

grouped in three classes ; (1) the clovers, intended chiefly to enrich the land with stores of nitrogenous compounds, and to bring it to a higher grade of fertility ; (2) the top grasses, which have the power of striking root deep into the land, and of sending up large leaves into the air—among these are included Italian rye-grass, timothy, meadow fescue, tall fescue, cock's-foot, tall oat-grass ; and (3) the sole or bottom grasses, which play the subordinate part of stop-gap, filling up with their small leaves the blank spaces between and below the top grasses. With their shallow roots they exploit and utilise the surface soil, but the soil depths are quite beyond their reach. These were represented in these experiments by perennial rye-grass.

The mixtures tested, which are described in the Table below, were divided into four classes ; in one class, rye-grasses were used, not only in excess but in very large excess ; a second class of mixtures were without rye-grass ; a third class were well-balanced all-round mixtures ; and in the fourth class each mixture contained one special ingredient in excess, viz., No. 7, Italian rye-grass ; No. 8, Timothy ; No. 9, cock's-foot ; and No. 10, meadow fescue.

Name of Plant.	Rye-grass Mixtures.			Mixtures without Rye-grass.			Normal Mixtures.				Special Mixtures.			
No. of Mixture.	1	2	5	11	12	14	3	4	6	13	7	8	9	10
	Weight per acre of each seed in pounds													
Red clover...	2·3	2·3	2·3	2·3	2·3	2·3	2·3	1·8	—	2·3	2·3	2·3	2·3	2·3
Alsyke clover	1·4	1·4	1·4	1·4	1·4	1·4	1·4	1·1	2·1	1·4	1·4	1·4	1·4	1·4
White clover	1·2	1·2	1·2	1·2	1·2	1·2	1·2	1·0	1·8	1·2	1·2	1·2	1·2	1·2
Kidney vetch	—	—	—	—	—	1·1	—	—	—	—	—	—	—	—
Italian rye-grass	—	19·25	2·8	—	—	—	5·5	4·4	5·5	5·6	11	5·5	5·5	5·5
Timothy ...	—	—	2·1	5·2	3·1	2·1	2·1	1·7	2·1	2·1	1·0	4·2	1·0	1·0
Meadow fescue	—	—	2·8	14	11·2	5·6	8·4	6·7	8·4	5·6	5·6	5·6	5·6	14
Tall fescue...	—	—	—	—	4·0	4·0	—	—	—	4·0	—	—	—	—
Cock's-foot...	—	—	1·7	6·6	5·1	3·3	3·3	2·6	3·3	3·3	3·3	1·7	6·6	1·7
Tall oat-grass	—	—	—	—	6·0	3·0	—	—	—	6·0	—	—	—	—
Perennial rye-grass ...	42	21	27	—	—	—	15	12	15	6	15	15	15	15
Chicory ...	—	—	—	—	—	1·2	—	—	—	—	—	—	—	—
Burnet ...	—	—	—	—	—	2·0	—	—	—	—	—	—	—	—
Average yield of hay for (10 farms), first year cwt.	46	41½	47	38¾	42¾	42¼	46¼	47¼	42¼	41¼	41¾	40¾	41	42

Average Yield of Hay for First Year.—It has often been stated that without large excess of rye-grass, it is impossible to get a full crop of hay for the first year. The above Table, however, shows that taking the average of ten farms, the normal mixtures (Nos. 3 and 4) surpass for hay production the rye-grass mixtures (Nos. 1 and 2), and are approximately equal to the other rye-grass mixture (No. 5). There is also the significant fact that the thin sown normal mixture (No. 4) surpasses the thick sown normal mixture (No. 3), so far as hay production is concerned. Professor M'Alpine observes that this means that we may reduce the quantity of rye-grasses and still obtain a good crop of hay. In mixture No. 4, which yielded, on the average, the largest hay crop, there were only 4½ lb. of Italian and 12 lb. of perennial rye-grass.

Freedom of the Pasture from Weeds.—The experiments were inspected in the autumns of 1902 and 1904. These inspections showed that the rye-grass mixtures (Nos. 1 and 2) surpassed all the other plots for foulness. The normal mixtures were not so efficient in checking weeds as the special Timothy and cock's-foot mixtures (Nos. 8 and 9), which were the best of all in this respect.

Mixtures that Produced the Best Pasture.—The rye-grass mixtures (Nos. 1 and 2) turned out pastures incomparably inferior to that of some of the other mixtures, lacking the green appearance, the attractiveness to stock, and that body which signifies good pasture capable of maintaining the greatest number of animals. Among the plots without rye-grass, the complex mixture (No. 14) usually took a high place for pasture. On the average, the best pasture mixtures were :—Normal mixtures : (Nos. 3, 4, and 13) ; Special mixtures, timothy and cock's-foot (Nos. 8 and 9), and mixtures without rye-grass (No. 14).

Improvement of the Land.—The rye-grass mixtures tended to deteriorate the land under them, for two main reasons : (1) the perennial favoured the growth of Yorkshire fog, and (2) the Italian checked the growth of red clover. The normal mixtures (Nos. 3 and 4) improved the land, for in them the weeds were checked and the clover specially favoured ; this was also the case with No. 9.

Summary.—Professor M'Alpine concludes his Report with

the observation that the experiments taken, as a whole, show that it is unprofitable to use mixtures containing large excess of rye-grass, and that mixtures with a moderate amount of rye-grass gave as large a hay crop, and, at the same time, better clover and better and cleaner pasture.

Another point, quite clearly brought out by these experiments, is the urgent necessity for a very stinted use of Italian rye-grass. If the red clover is to get a fair chance of surviving and persisting, it must not be shaded out, nor drawn up and weakened by over-shadowing Italian rye-grass.

A third point is that weeds, such as Yorkshire fog and agrostis, may be kept in check by the proper use of timothy, cock's-foot, meadow fescue, and, what are called in general, "top grasses."

Importance of Analysing Oil-Cakes.

The Board have recently had their attention drawn to a case in which, in consequence of the loss of several lambs, the owner had samples taken of the cakes with which they were being fed. On these being analysed by the District Agricultural Analyst, they were found to contain an undue proportion of sand. In the case of one, described as a "special milk-cake," the proportion was $2\frac{1}{2}$ per cent., and in the other, an "extra oil-cake," 1·9 per cent., and the analyst was of opinion that so much sand as that in the milk cake would be very likely to be injurious to calves, and presumably also to lambs. The milk cake, moreover, was deficient in albuminoids, and the oil-cake in oil. This is an instance of the importance to farmers of having their feeding stuffs regularly analysed, and of purchasing under a definite invoice stating the guaranteed proportion of oil and albuminoids, and preferably also of carbohydrates. Compound cakes, in particular, it must be remembered, furnish an opportunity of getting rid of material (such as musty cake, warehouse sweepings, &c.) that cannot readily be sold in any other way, so that the buyer of compound cakes has a special inducement to deal with a firm of high reputation, and frequently to take the opinion of an experienced chemist. That the cake was the cause of the death of the lambs in the above instance appears to be proved by the fact that when its use was stopped no more deaths occurred.

Use of Apples for Cattle-Feeding.

Reference to the use of apples for cattle-feeding was made in a previous number of this *Journal* (December, 1904, p. 549), and it was pointed out that this is regarded in France as a useful method of employing any surplus crop which cannot be otherwise profitably or conveniently dealt with. An experiment which was carried out in the past year at the Canadian Experimental Farm, also suggests that this means of using refuse apples is one which may be adopted with satisfactory results. Four cows about six months in milk were selected. They were fed on the usual ration of 50 lb. of silage and roots, 4 lb. of hay, and 7½ lb. of meal, for two weeks; in the two following weeks 25 lb. of apples replaced 30 lb. of the roots and silage previously given, the quantities of hay and meal remaining the same. The total yield of milk by the four cows in the first fortnight was 1,353 lb. and in the second fortnight 1,395 lb., and their average weight at the beginning of the apple-feeding period was 985 lb., and at the end it was 1,008 lb. If the value of the apples is estimated at the cost of the food saved, they would be worth about 10s. a ton, roots and silage being valued at 8s. 4d. per ton.

The cows seemed to relish the apples, which were of different sorts, and to thrive upon them, as shown by the gain of 23 lb. per cow made in fourteen days while on apples; whereas, during the subsequent two weeks the animals went back and a loss of 16 lb. per cow occurred. The health of the cows seemed to be very favourably affected by the apples. Calves were given a few apples each day, and seemed to like them.

Live Stock Import Regulations:— South Australia.*

Horses, cattle, sheep and swine may be imported into South Australia from Great Britain under the provisions of the Stock Diseases Act, 1888. The regulations subject to which importations may take place are as follows:—

All cattle, sheep and swine imported

* Live stock import regulations have been published in this *Journal* for the following countries:—Transvaal, March, 1903; United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; and New Zealand, June, 1905.

from Great Britain must be shipped from London, Liverpool, or Glasgow, and landed at Port Adelaide.

Horses, cattle, and sheep may, with the consent of the Minister for the time being controlling the Stock Department, be imported into the northern territory of the Colony at Port Darwin.

Not less than fourteen days' notice in writing shall be given to the Chief Inspector of Stock at Adelaide, giving particulars of the description and number of the stock to be introduced, the time and place of shipment, and the name of the vessel by which they are expected to be conveyed to South Australia.

Three declarations with regard to the health of the stock are required, viz.: (1) A declaration signed by the owner or consignee and by the District Veterinary Surgeon; (2) A declaration by the Veterinary Surgeon at the port of shipment; and (3) A declaration made at the end of the voyage by the captain of the vessel. Each of these declarations must be made before a Justice of the Peace, and they must be forwarded to the Chief Inspector at Adelaide within twenty-four hours of the arrival of the stock.

These declarations are briefly to be as follows:—

(1) The owner or breeder is to declare that the stock to be imported are and have been free from infectious and contagious disease for the preceding sixty days, and that during the same period they have not been in contact with, or on the same farm as any infected animal. A local Veterinary Surgeon must examine the stock, and verify the above declaration.

(2) A duly qualified Veterinary Surgeon at the port of shipment is to examine the stock and furnish a declaration that they are free from disease.

(3) The captain or master of the vessel on arrival is to certify that no disease of any kind has shown itself in the stock during the voyage.

All stock on arrival must be examined on board by the Government Veterinary Surgeon, and may be dressed or disinfected in such manner as the Chief Inspector shall direct. No stock suffering from any disease may be landed in the Colony from any vessel, and any stock arriving at any port in the Colony suffering from any disease, or affected with any disease

whilst in quarantine are to be forthwith destroyed or disposed of as the Commissioner shall direct.

All stock from Great Britain and Ireland landed in South Australia pursuant to these regulations will be detained in quarantine for the following periods respectively :—Horses, fourteen days ; cattle, forty days ; sheep and swine, thirty days. In addition, all cattle affected with the "ox warble fly" may be detained in quarantine for such further period as may be deemed necessary.

Expenses of landing, quarantine, maintenance, disinfection &c., of any stock, must be paid by the owner or consignee of such stock before removal from quarantine.

Milk Tests in Wisconsin.

A system of testing the milk yield of pure-bred dairy cows has been in operation in Wisconsin since 1894 in connection with several breeding societies, who offer prizes for the best records made and place the animals whose milk reaches a certain standard on a special register. These tests have become a material factor in the purchase and sale of dairy cattle, and it is stated that prices paid for pure-bred cattle at auction sales have in recent years been determined primarily by their records in these tests, the build and type of the animals being given a second place.

The tests are carried out by a representative of the Wisconsin Experiment Station, who sees the cow milked, weighs the milk, samples and tests it in duplicate. The length of the tests varies according to the requirements of the societies, but they may extend over seven days or thirty days or they may be made on one day each month. The requirements for admission to the register in the case of the Holstein Friesian Association are that cows shall produce in the course of seven days at two years old 7·2 lb. of butter-fat ; at three years old, 8·8 lb.; at four years old, 10·4 lb.; and at five years old or above, 12·0 lb. For every day above two, three, or four years the requirements are increased by ·00439 lb.

In the case of the American Guernsey Cattle Club, cows are required to yield 10 lb. of butter-fat in seven days at two years old, and this figure is increased by ·00456 lb. per day for older cows until five years of age, when the required amount will have reached 15 lb.

English Stallions for Italy.

The *Bollettino Ufficiale* of the Italian Ministry of Agriculture, Industry, and Commerce announces that tenders are invited for the supply to the Italian Government of thoroughbred English stallions. Offers of sale, made out on stamped paper of 1 lira 20 cents (obtainable from the Italian Consulate-General in London, 44, Finsbury Square, E.C.) should reach the *Ministero di Agricoltura, Industria e Commercio* (*Direzione Generale dell' Agricoltura Ispettorato zootecnico*), Rome, by October 10th. Stallions may be presented for inspection at Milan on November 1st; at Pisa on November 4th; or at Santa Maria Capua Vetere on November 6th.

Export of Butter from Siberia.

The Board of Trade have recently published a Report by Mr. H. Cooke, Special Commissioner of the Commercial Intelligence Committee, on the condition and prospects of British trade in Siberia.* Mr. Cooke gives some account of the state of agriculture in that country so far as it affects the export trade, and describes in detail the wonderful progress made in recent years in the butter-making industry. Previous to 1893 no butter was produced in Siberia for export abroad, whilst ten years later, in 1903, the total export amounted to 600,000 cwt. The number of dairies in operation in 1900 was 1,064, and these had increased to 2,035 in 1902. A summary of much of the information obtained by Mr. Cooke on this subject has already appeared in this *Journal* (Vol. X., December, 1903, p. 370).

* *Cd.* 2,518. *Price* 1*s.* 3*d.*

Report of the Committee on the Fruit Industry.*

The President of the Board of Agriculture and Fisheries appointed a Committee in December, 1903, to enquire into and report upon the present position of fruit culture in Great Britain, and to consider whether any further measures might with advantage be taken for its promotion and encouragement.

The following gentlemen were members of the Committee :— Mr. A. S. T. Griffith-Boscawen, M.P. (chairman), Mr. C. W. Radcliffe-Cooke, Mr. J. M. Hodge, Colonel C. W. Long, M.P., Mr. George Monro, Mr. Percival Spencer Pickering, M.A., F.R.S., Dr. William Somerville (an Assistant Secretary of the Board of Agriculture and Fisheries), Mr. Edwin Vinson, and the Reverend William Wilks, M.A. (Secretary of the Royal Horticultural Society).

The Committee, after holding forty-nine meetings and examining sixty-one witnesses, have now presented their Report, in which they point out that the cultivation of fruit, though but a small part of agriculture generally, especially if judged by acreage alone, is a growing industry in Great Britain, and that its increase in recent years has been remarkable ; and they consider the opinion to be well founded, that still more fruit might be advantageously grown, provided that certain difficulties and disabilities were removed, and if extension were directed into the proper channels. Nearly all the witnesses argued that the British grower was unfairly handicapped in some respects at the present moment, though their grievances differed very largely, some laying stress on one thing, and some on another ; and their suggested remedies differed even more widely. The Committee analyse these grievances and the suggested remedies in their Report, and conclude by making a number of recommendations and suggestions, which may be summarised as follows :—

1. That a special sub-Department of the Board of Agriculture and Fisheries be established to deal with matters connected with the fruit industry. That there be two branches of such sub-Department : (*a*) a bureau of information ; (*b*) an experimental fruit farm.

* *Cd.* 2589. *Price* 4½*d.*

2. That after the establishment of the Government sub-Department, its attention be directed to the necessity of preventing the importation of diseases and insect pests through the importation of diseased fruit and nursery stock.

3. That the question as to the desirability of setting up compulsory powers for the eradication of diseases and insect pests in this country be postponed until fuller knowledge is obtained through the work of the Government sub-Department.

4. That horticulture be taught in elementary schools in country districts, and that such schools should have school gardens attached wherever possible. That the attention of Local Education Authorities should be called to this, and also to the desirability of encouraging the study of practical horticulture in training colleges.

5. That the present defective form of returns made by growers for land under fruit should be improved and amplified.

6. That estimates of home and foreign crops should be published, together with forecasts of the probable date of arrival of imports.

7. That the various Agricultural Holdings Acts should be consolidated into one Act.

8. That the Market Gardeners' Compensation Acts be amended by making section 4 retrospective.

9. It is further suggested that, in cases where a tenant gives notice to quit, he shall not be entitled to receive compensation unless he presents to the landlord a successor who is willing to take over the holding at the same rent: that in the event of his so doing, and the landlord accepting his nominee, the compensation be paid directly by the new tenant to the old tenant, but that the landlord have the right to refuse to accept the outgoer's nominee, in which case he must pay compensation to the outgoer under the provisions of the existing law.

10. That the Board of Agriculture should appoint experts in fruit valuation, and should call them together for the purpose of formulating general rules for estimating the amount of compensation to be paid to an outgoing tenant of a holding under the Agricultural Holdings Acts on the basis of the value to an incoming tenant.

11. That the State be empowered to lend money to landowners who have fruit on their estates, subject to suitable conditions, for the purpose of supplying the ready money required for the payment of compensation at the determination of a tenancy.

12. That it would be to the advantage of landowners and tenants in fruit districts if, under the provisions of section 5 of the Agricultural Holdings Act, 1883, they settled the basis of compensation by the "particular agreement" therein referred to.

13. That an Act should be passed for facilitating the purchase of small holdings by tenants with assistance from public funds, somewhat on the lines of the measure brought in by the Right Honorable Jesse Collings, M.P., in the Session of 1904.

14. That Rule No. 8 for the assessment for income-tax, whereby market gardens and nurseries are assessed for Schedule B according to the rules of Schedule D, be repealed so far as it applies to market gardens.

15. That in the assessing of agricultural holdings for local rates, the assessments should not be raised by reason of the planting of fruit for a period of five years after the planting in the case of small fruit, of seven years in the case of mixed plantations, and twelve years in the case of orchards.

16. That in the case of glass-houses, the allowance of one-sixth, given to dwelling-houses for repairs in the assessment for income-tax, be increased to one-third, by making a special allowance of one-sixth for renewal, in addition to the one-sixth for repairs.

17. That the benefits of the Agricultural Rates Act of 1896 be extended to glass-houses used for commercial purposes.

18. That it is highly desirable that a more simple and uniform system of rates for fruit be introduced by the railway companies. This can be done without a statutory reclassification, with the assistance of the Board of Trade.

19. That railway companies should make greater efforts for ensuring the prompt delivery of perishable fruit.

20. That railway companies be urged to provide suitably ventilated goods vans for fruit traffic, similar to those recently

introduced by the Midland Railway Company. That sheeted trucks without sheet supporters should never be used.

21. That it is most desirable that all fruit be consigned at company's risk, and that the so-called owner's risk rates be abolished ; the rates at company's risk being reduced to a figure approximating to those now in force at owner's risk, but providing the companies with just a sufficient margin for the extra liability incurred. That 5 per cent. would be a fair margin.

22. That, in the event of owner's risk rates being retained, the liability of the railway companies should not be confined to cases where only wilful misconduct, but to those where culpable negligence, can be proved.

23. The Committee also suggest that, in view of the recent tendency to combine among the railways, it would be an advantage if the Government were to appoint an official or a Department to watch over the companies' actions, and to report to Parliament.

24. That in the case of all serious grievances against the railway companies, growers and merchants should at once send their complaints to the Railway Department of the Board of Trade, and ask them to exercise their powers under the Conciliation Clause of the Act of 1888.

25. That in years of glut, railway companies should be urged to temporarily lower their rates for fruit, just as excursion passenger fares are lowered on special occasions, and that, if this cannot be done by agreement, it is desirable that the Railway and Canal Traffic Act of 1894 should be amended for that purpose.

26. That jam made wholly or in part from foreign fruit be so labelled.

27. That the Government should undertake the inspection of imported fruit and fruit pulp at the ports of entry.

28. That it would be an advantage to fruit growers and to the public generally, if the Local Government Board collected statistics of the fruit seized and condemned as unfit for food.

29. That the present bye-laws for building in country districts be modified so as to allow of the cheaper construction of cottages.

30. That boys in industrial schools should be allowed to stay away from such schools for the purpose of fruit-picking, subject to suitable regulations.

31. That the provisions of the Robson Act as to "half-timers" be made generally known, and applied by Local Education Authorities in country districts.

32. That with regard to markets, it is desirable that more local markets, similar to that of Kew Bridge, be established in the suburbs of London. That as regards the large distributing markets in provincial centres, it is desirable that certain of these be extended and improved. That the provision of retail markets in many country towns is urgently needed, and that very good results would be likely to follow if the Councils of other towns followed the example set by Hereford in establishing a fruit market under their own authority.

33. That the telephone should be further extended in country districts.

34. That county councils, in the publication of any orders made by the Home Secretary on their application under the Wild Birds' Protection Acts, should clearly state the powers belonging to owners and occupiers of land under these Acts.

35. That it is desirable that an enquiry be instituted into the alleged practice of growing fruit on sewage farms, and the effect of such a practice on the public health.

36. That fruit growers should pay more attention to the careful packing and proper grading of better-class fruit, and to the selection of the right kinds of fruit to plant according to the soil, and to the importance of cultivating fewer varieties, especially of apples.

37. That the establishment of co-operative societies, similar to that existing at Blairgowrie, for the disposal of fruit, and for other purposes, such as the obtaining of adequate supplies of pickers, would be beneficial, particularly in districts where there are many small holdings.

38. That it would be an advantage to fruit growers if they kept bees in connection with their fruit plantations.

39. That the attention of landlords, especially in the West of England, should be called to the pressing need of renovating and re-planting the decayed orchards on their property.

40. The Committee are also of opinion that, in connection with the proposed Government sub-Department, it might be advantageous that a large fruit farm should be established in proximity to the experimental farm, where fruit growers and lecturers could receive a practical training.

Report of the Animals Division.

This volume* contains a review of the proceedings of the Animals Division of the Board of Agriculture and Fisheries during the year 1904 in the form of reports by the Chief Veterinary Officer and by the Assistant Secretary in charge of that Division.

The outstanding fact in connection with the work of the Animals Division during the year 1904 was the complete immunity of Great Britain for another year from the diseases of cattle-plague, pleuro-pneumonia, sheep-pox, foot-and-mouth disease, and from rabies, whilst during the year there was a material reduction, not only in the number of outbreaks of swine-fever, but also of sheep-scab. On the other hand, there was a slight increase in the number of reported outbreaks of glanders and a marked rise in those of anthrax. Full particulars are given in regard to the steps taken by the Board during the year to eradicate these diseases, together with comparative statistics showing their prevalence in different parts of Great Britain.

Two sets of coloured maps are included showing the number of cases of swine-fever and sheep-scab in each county during the past three years.

The most satisfactory result in connection with the work carried out by the Department during 1904 has been the decrease of swine-fever: 9,147 reports of suspected cases were received, of which only 1,196 were confirmed by the officers of the Board. What is most encouraging in this connection is the fact that the number of outbreaks continued to decrease during the last months of the year.

* Proceedings under the Diseases of Animals Acts, the Markets and Fairs (Weighing of Cattle) Acts, &c., for 1904. [Cd. 2,454.] Price 11d.

Ten years have elapsed since the Board were called upon to undertake the extremely difficult task of eradicating this obscure and troublesome disease, one which has never yet been successfully dealt with in any country where it has once obtained any degree of prevalence. In looking at the results of the work carried out during that period it appears that in 1894 the disease was reported from seventy-three counties in Great Britain, that 5,682 outbreaks were confirmed by the veterinary officers, and no fewer than 56,296 swine were slaughtered, for which compensation was paid by the Board. In the year 1904, however, it was reported from sixty-four counties, while the number of outbreaks confirmed has fallen to 1,196, and only 5,603 were slaughtered as diseased, or as having been in contact.

For reasons which have been explained in former reports, swine-fever must necessarily be one of the most difficult of all contagious diseases of animals to exterminate, because in the case of animals of six months old and upward, it is often so occult that the owners are frequently unaware that their pigs are affected, and for this reason a large number of centres of infection escape notice altogether. It is a matter of by no means uncommon occurrence when the veterinary officers of the Board are examining the intestines of contact pigs, in London, to discover that some of them have already passed through the active stage of the disease and recovered, without the owner having the least idea that animals had been affected.

In connection with the recent extension in the outbreaks of anthrax the question has naturally arisen whether any cause can be discovered for the comparative prevalence of anthrax in certain counties and for its sudden increase during the past year in other counties. With this object detailed enquiries are now made by the Board's inspectors, and, among other points, they are instructed to enquire particularly as to the feeding stuffs or other materials used for and about the animals. As regards this source of infection it is to be noted that Professor McFadyean has expressed the opinion that "a considerable number of cases of the disease in this country have an extraneous source of infection, and that the vehicle of infection is not infrequently some artificial food stuff of which the raw

material is derived from a foreign country." An analysis of the reports gives some support to the view that the origin of the outbreak may in many cases be due to infection conveyed in the manner suggested. In fully a third of the cases enquired into it has been found that some kind of artificial feeding stuff had been given to the diseased animal up to the time of death, and in some of them the circumstantial evidence appears to be sufficiently strong to warrant the conclusion that infection was induced by this means. It is undoubtedly the case that large quantities of the materials used in connection with the manufacture of cake for feeding stock are imported from countries where anthrax is rife, and there must, it is thought, be an element of risk in the use of the manufactured article. In like manner it is possible that the infective material may also be occasionally introduced through the medium of bone manures.

Another interesting point to which reference is made is the great difficulty which arises in connection with the prevention of the spread of contagious abortion in a herd of cows. This is due to the fact that as a general rule it is not until a number of animals have already aborted, and many have already become infected, that it occurs to the mind of the owner that it may possibly be due to contagion. Abortion may arise from so many causes that the ordinary cow-keeper is apt to regard the loss of one or two calves from premature birth as inevitable, and he therefore includes it among the ordinary risks connected with his trade. In fact, it may be said that even the most enlightened farmer would hardly be disposed to regard his first case of abortion as being due to contagion, and at once commence to treat his whole herd according to the instructions laid down in the Board's leaflet. (No. 108.)

Agricultural Statistics, 1904.

The complete volume of agricultural statistics for 1904 published by the Board of Agriculture and Fisheries, which is prefaced by a Report by Major Craigie, brings together the information collected in the agricultural returns already separately issued, and furnishes particulars of the imports and exports of agricultural produce, the prices of corn, of live stock and other commodities, together with the latest statistics relating to the agriculture of British possessions and foreign countries.

The collection of the returns of acreage and live stock has been, as in other years, effected by the Officers of Inland Revenue, but by an administrative re-adjustment, the Inland Revenue authorities have been relieved of the responsibility for the appointment and supervision of Crop Estimators, and direct communication has been arranged between the Board and the Estimators. This arrangement, while increasing the work done by the Department, has tended in some degree to facilitate the compilation of the Returns.

Among the new features in the Report is the publication of the dates of commencement and termination of harvest as stated by the Estimators in different districts, together with a summary of the average duration of harvest operations for wheat, barley, and oats in Great Britain.

The statistical information respecting the prices of animals, meat, wool, and other agricultural produce has been considerably developed in 1904. While with one exception the tables previously given have been retained in order to allow of comparisons with earlier years, somewhat extensive additions to the tables of prices of agricultural produce have now become possible by utilising the new price returns furnished directly to the Board, in pursuance of the recommendations of Lord Mansfield's Committee.

Attention is drawn by Major Craigie to several interesting points in connection with the imports of agricultural produce, and the fluctuations in the sources of our wheat and maize imports are shown in tables which give the percentage of both grains received from various countries during the past five years.

Major Craigie also discusses in some detail the figures which are available from foreign countries relating to the area and production of wheat and other grains and the number of live stock. He points out that without taking account of the cultivation pursued in countries whence no official records have been furnished, some thirty separate national units returned, at the most recent available date, a total acreage of about 219 million acres under wheat. Grouping some of the units thus separately accounted for under three national flags, it is found that the Russian Empire with its Asiatic possessions, the British Empire with its Indian territories and Colonial possessions, and the United States of America, furnish quite two-thirds of the aggregate wheat area just quoted. Their relative magnitude in this respect, and the estimated produce roughly credited to each for the latest year, is shewn as under :—

States.	Area under Wheat.	Estimated Production.	Yield per Acre.
	Acres.	Quarters.	Bushels.
Russian Empire... ...	57,000,000	77,000,000	10·8
United States of America	44,000,000	67,000,000	12·1
British Empire	40,000,000	69,000,000	13·8

In constructing such a table at this moment it is pointed out that the American quota is put relatively somewhat low owing to the unfavourable character of the latest harvest, and the British Empire's yield, owing to the large Indian crop of 1904, is probably unduly high. But whatever allowance might have to be made were average areas and average crops to be measured, there is no State which comes near contesting the position of the three above enumerated as large wheat producers. The low average yield per acre of territories so vast and varied is an incident to be expected, for the means above given include in each group results realised under very different conditions. Nowhere for an area of equal size is so high a yield obtained as in Great Britain herself with a return of 31 bushels per acre over the last ten years. But in an Imperial average we have to count with the meagre yield of

our Australian Colonies and of some parts of India where the wheat production may fall to 7 bushels to the acre, while similar low estimates for Russian Siberia and for the Southern States of the American Union leave their mark on the average in each case.

The Report concludes with comparisons of the cattle and sheep in various countries in proportion to their population and total area, and draws attention to the remarkable changes which have taken place in the last thirty years in the flocks of sheep maintained in the countries of Continental Europe.

Notice as to Ordnance Survey Maps.

The revision of the coloured map of England and Wales on the scale of four miles to one inch is now complete. In these maps the principal features of the country are shown in colour. The maps are folded outwards, so as to admit of being read without opening the whole map, a method specially adapted for motorists and cyclists. The size of each sheet is $22\frac{1}{2}$ in. by 15 in., and the price is 1s. 6d. on paper, folded or flat; 2s. mounted, folded or flat; or 3s. cut into sections and mounted to fold.

Resembling the above in its general features is the map on the scale of two inches to one mile. The area published includes the south, the south-midland, and eastern counties of England and Wales, and the sheets recently issued include the districts around Sheffield, Norwich, Barmouth, Leicester, King's Lynn, Cardigan, St. David's, Llandovery, Pembroke, Swansea, Lincoln, Stoke-upon-Trent, Nottingham, and Peterborough.

The coloured map on the scale of one inch to the mile is complete for the whole of England and Wales. The scale on which this map is drawn makes it useful for general topographical purposes. It is especially serviceable to pedestrians, since it shows the roads, indicating their character and whether metalled or not, footpaths, hills, rivers, towns, villages, railway stations, and local boundaries.

The size of each sheet of this map and of that on the scale of two miles to one inch is 18 in. by 12 in., and the price is 1s. on paper, folded or flat; 1s. 6d. mounted, folded or flat; or 2s. cut into sections and mounted to fold.

A map which has recently been completed is that of the United Kingdom on the scale of sixteen miles to one inch. This was published in consequence of the recommendation of the International Geographical Congress that a map of the world should be prepared on this scale. It is useful as a wall map and for educational purposes, and may be purchased in two sheets, price 5s.; or, mounted as a wall map, 10s.; or with moulding and roller, 20s.

Copies of these and other Ordnance Survey maps may be obtained from the local agents, or, through any bookseller, from the Ordnance Survey Office, Southampton. Copies may also be ordered through Head Post Offices in towns where there are no agents.

Changes in Agricultural Wages in 1904.*

According to the information collected by the Labour Department of the Board of Trade, the rates of wages of farm labourers in England and Wales continued to show a slight upward tendency in 1904. This tendency has been much less marked during the past three years than in the five years 1897–1901.

Wages remained unaltered in districts with 368,780 farm labourers, but they were increased in districts containing 23,778 labourers, and reduced in districts containing 9,568.

In the following Table the figures for various groups of counties are arranged according to the amounts by which rates of wages were changed. The Table shows that the greatest number of labourers affected in any one district by increased rates of wages was in the Southern and Western counties, where complaints of scarcity of farm labour have been most numerous in recent years. The district most affected by decreases was

* See also "Harvest Wages in 1904," *Journal*, November, 1904, Vol. XI., p. 502

Wales, where in certain counties slackness in mines and quarries is stated to have caused an increase in the supply of labour.

District.	6d. and under per week.	Over 6d. and up to 1s. per week.	Over 1s. and up to 2s. per week.	Total.
Total Number of Labourers in Districts in which Wages Rose.				
Northern Counties ...	—	849	—	849
Yorkshire, Lancashire and Cheshire ...	—	656	—	656
Eastern and Midland Counties	—	7,928	—	7,928
Southern and Western Counties	3,385	7,105	1,236	11,726
Wales	1,052	1,241	327	2,620
Total	4,437	17,779	1,563	23,779
Total Number of Labourers in Districts in which Wages Fell.				
Northern Counties ...	—	209	—	209
Yorkshire, Lancashire, and Cheshire ...	534	2,345	—	2,879
Eastern and Midland Counties	—	1,900	—	1,900
Southern and Western Counties	1,280	—	—	1,280
Wales	—	1,995	1,306	3,301
Total	1,814	6,449	1,306	9,569

Information as to the rates of wages agreed upon at hiring fairs in Scotland was obtained by the Department from a correspondent who made special enquiries on the subject.

The correspondent reported that at the Spring hirings the supply of men seeking situations was about equal to the demand, and that while there was no change in rates of wages in the great majority of cases, they showed on the whole a downward tendency. At the hirings held in the latter half of the year the supply of men was decidedly in excess of the demand, and wages generally showed a fall of from £1 to £2 per half-year. In some cases, however, farm servants remaining in their places sustained no reduction.

Lads were not so plentiful as men, but, as a result of the fall in men's wages, those for lads also declined a little in many districts.

The supply of female servants continued to be short of the demand, and their rates of wages were well maintained.

Congress on Agricultural Education at Liège.

An International Congress on the subject of Agricultural Education will be held on July 28th and 29th next at Liège Universal Exhibition. It will comprise four sections :—(1) Higher agricultural education; (2) secondary and practical instruction; (3) instruction in elementary schools, migratory classes, courses of instruction for adults; and (4) other means of popularising agricultural knowledge.

Notes as to Agricultural Machinery Abroad.

Exhibition of Agricultural Machinery in Italy.—The Commercial Intelligence Branch of the Board of Trade have been notified by the Italian Chamber of Commerce in London that an International Exhibition of Agricultural Machinery and Spirit Motors will be held at Cuneo, Italy, from August to October next, under the patronage of H.M. the King of Italy.

Special prizes are to be given in this exhibition. The Italian Government have granted the temporary introduction, free of duty, of goods destined for the exhibition; and facilities have also been arranged by the Italian railways.

Full particulars may be obtained on application to the Italian Chamber of Commerce in London, 4, St. Mary Axe, E.C.

Exhibition at Milan.—An Exhibition will be held at Milan in 1906, and will include an international section for the exhibition of agricultural machinery and implements.

Agricultural Machinery in Asia Minor.—The British Vice-Consul at Adana, Asia Minor, says, in his recent report, that the importation of British threshing-machines seems likely to increase in the future. Altogether some fifteen reaping and threshing machines were imported from the United Kingdom during the year 1904; but while the British threshing-machines are generally preferred, there seems to be a tendency to buy American reaping machines, chiefly owing to their lightness. The sale of such articles is still only in its infancy, but appears likely to become an important business, in spite of the hostility on the part of thousands of labourers who are in the habit of coming from

the interior to work on the Cilician plain during the harvest. (*Foreign Office, Annual Series*, 3,363.)

List of Buyers of Agricultural Machinery.—Lists may be consulted free of charge by British manufacturers and traders at the offices of the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C. Amongst lists which have recently been received are the following :—

Lists of manufacturers and importers of agricultural implements and machinery, and likely users of various classes of machinery, in Adelaide, South Australia.

Lists of agricultural implement dealers, makers and importers, flour mill proprietors, and in some cases also of estate owners and other persons likely to buy agricultural implements and various kinds of machinery in the following towns :—Bordeaux, Bilbao, Oporto, Trieste, Florence, Milan, Palermo, Salonica, The Piræus, Stockholm, and Warsaw.

Agricultural Machinery in Argentina.—H.M. Consul at Rosario (Mr. H. M. Mallett), in his Report on the trade of the district for 1904, states that the sale of agricultural machinery and implements has been important, and notwithstanding that merchants imported largely, anticipating the demand which the good harvest would bring, their stock has run short and new orders have been given. There is a ready market for agricultural machinery and implements. (*Foreign Office, Annual Series*, 3,362.)

Agricultural Machinery in India.—The United States Consul-General at Calcutta, in a recent Report, observes that his attention has been called to the slow and wasteful harvesting in India. The threshing is done by hand, or by bullocks treading out the grain, and the winnowing is done by hand. Both processes are slow and wasteful. Threshing and winnowing machines adapted to this country, capable of being moved from place to place, he thinks, would prove a great success. Manufacturers of agricultural machines should send experts to study the situation. If economy in harvesting were introduced much larger crops could be raised and saved.

ADDITIONS TO THE LIBRARY DURING JUNE.

Africa—

Natal.—Minister of Agriculture, Report, Jan., 1903—June, 1904. (17 pp.)
Natal.—Government Entomologist, 1903-4, Report. (47 pp.)

Australasia—

New Zealand.—Annual Sheep Returns, 1903-4. (142 pp.)

Austria-Hungary—

Bericht über die Verbreitung der Reblaus (*Phylloxera vastatrix*) in Osterreich in 1902 und 1903.

Canada—

Experimental Farms, Reports for 1904. (509 pp.)

Denmark—

Farming in Denmark. Report by the Scottish Agricultural Commission of 1904. (152 pp.)

France—

Silvestre C.—Annuaire de l'Agriculture et des Associations Agricoles, 1905. (2,498 pp.)
Curé, J.—Ma Pratique de la Culture Maraichère ordinaire et forcée. (256 pp.) 1904.
Moreau, G.—Culture du Houblon. (115 pp.) 1905.
Rocques, X.—Le Cidre. (171 pp.) 1899.
Houdaille, F.—Météorologie agricole. (204 pp.)
Desmoulins, A.—Procédés de conservation des Produits et Denrées agricoles. (169 pp.) 1896.
Larbalétrier, A.—Résidus industriels employés comme engrais. 2 vols. (200 + 160 pp.)
Gornevin, C.—Production du Laït. (172 pp.)
Kayser, E.—Les Levures. (212 pp.) 1905.
Berthault, F.—Les Prairies. 4 vols. (167 + 216 + 205 + 181 pp.)
Dabat, L.—Enseignement spécial agricole. Rapport du Jury international. (651 pp.) 1905.

Germany—

Sierig, Dr. E.—Landwirtschaftliche Versuchswesen in Deutschland. (98 pp.) 1905.
Eggers, W.—Praktische Fruchtfolgen. (99 pp.) 1905.
Marchet, J.—Holzproduction und holzhandel von Europa, Afrika und Nord-Amerika. (1 Band, 494 pp.) 1904.
Oelrichs, H.—Domänen-Verwaltung des Preussischen Staates. (520 pp.) 1904.

Great Britain—

Punnett, R. C.—Mendelism. (63 pp.) 1905.
Pratt, E. A.—Railways and their Rates. (361 pp.) 1905.
Haggard, H. Rider.—Report on the Salvation Army Colonies in United States and at Hadleigh, England. (14 pp.) 1905. [Cd. 2,562.]
Wright, W. P., and Dallimore, W.—Pictorial Practical Tree and Shrub Culture. (152 pp.) 1905.
Sladen, F. W. L.—Queen-Rearing in England. (56 pp.) 1905.
Ackworth, W. M.—Elements of Railway Economics. (159 pp.) 1905.

Switzerland—

Landwirtschaftliches Jahrbuch der Schweiz, 1904. (659 + 35 pp.)

United States—

Bureau of Chemistry :—Bull. 92. Effect of Water on Rock Powders. (24 pp.) 1905.
Bureau of Forestry :—Bull. 55. Forest Conditions of Northern New Hampshire. (100 pp.) 1905.
Bull. 24. A Primer of Forestry. Part II. Practical Forestry. (88 pp.) 1905.
Bureau of Plant Industry :—Bull. 72. Part III. Extermination of Johnson Grass. (14 pp. + III. plates.) 1905.—Part IV. Inoculation of Soil with Nitrogen-Fixing Bacteria. (10 pp.) 1905.
Bull. 75. Range Management in the State of Washington. (26 pp. + III. plates.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of June, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 11	7 7	37 0	34 5
Herefords	7 11	7 4	—	—
Shorthorns	7 8	7 2	36 1	33 6
Devons	7 9	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8	7¼	8½	6½
Sheep :—				
Downs	8¼	7½	8½	—
Longwools	7½	6¾	—	7
Cheviots	8¾	8	8½	8
Blackfaced	8	7¼	8¼	7½
Cross-breds	8	7¼	8½	7¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 6	5 11	6 6	5 9
Porkers	6 10	6 4	6 11	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	19 17	16 13	20 15	16 6
,, —Calvers ...	19 4	16 3	18 9	15 6
Other breeds—In Milk ...	19 5	14 13	18 2	14 12
,, —Calvers ...	17 14	12 19	18 1	15 2
Calves for Rearing	2 6	1 15	2 15	1 18
Store Cattle :—				
Shorthorns—Yearlings ...	9 4	7 18	10 15	8 14
,, Two-year-olds	12 15	11 5	14 7	12 13
,, Three-year-olds	15 14	14 4	18 15	14 10
Polled Scots—Two-year-olds	—	—	15 8	13 1
Herefords— ,,	—	11 12	—	—
Devons— ,,	13 4	11 9	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	37 7	34 3	—	—
Scotch Cross-breds ...	—	—	40 6	35 7
Store Pigs :—				
Under 4 months	26 9	20 0	26 0	20 4

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	54 0	52 6	53 6	51 0	57 0*	51 6*
	2nd	52 0	48 6	48 0	46 6	55 0*	47 6*
Cow and Bull ...	1st	—	45 6	45 0	44 6	43 0	41 6
	2nd	—	41 6	40 6	40 6	42 0	36 6
U.S.A. and Canadian :—							
Birkenhead killed	1st	51 0	51 6	50 6	50 6	52 6	49 0
	2nd	47 6	46 6	46 6	46 6	37 6	39 0
Argentine Frozen—							
Hind Quarters ...	1st	31 6	32 0	32 0	32 0	31 6	32 6
Fore ,, ...	1st	22 6	22 6	23 0	23 0	23 0	23 0
Argentine Chilled—							
Hind Quarters ...	1st	41 6	42 6	39 6	38 0	—	45 0
Fore ,, ...	1st	26 6	27 6	25 6	25 0	—	29 6
American Chilled—							
Hind Quarters ...	1st	56 0	54 0	53 6	54 0	55 6	55 6
Fore ,, ...	1st	34 6	33 6	33 0	32 6	34 6	34 6
VEAL :—							
British	1st	64 6	61 6	66 0	73 6	—	—
	2nd	57 0	48 6	60 6	68 6	—	—
Foreign	1st	62 6	—	56 0	—	—	60 6
MUTTON :—							
Scotch	1st	71 0	—	76 6	76 6	72 0	70 0
	2nd	65 0	—	71 6	72 0	67 0	60 6
English	1st	68 0	69 6	69 6	70 0	—	—
	2nd	60 6	55 0	65 6	65 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	49 0	58 0	59 0	59 0	63 0	—
Argentine Frozen ...	1st	32 6	32 6	32 6	32 0	32 6	32 6
Australian ,, ...	1st	31 6	30 6	31 0	31 0	32 6	—
New Zealand ,, ...	1st	42 6	46 0	41 6	42 0	35 0	—
LAMB :—							
British	1st	84 0	81 0	81 0	79 0	92 6	87 0
	2nd	76 6	74 0	77 0	73 0	81 6	80 0
New Zealand ...	1st	53 6	55 0	53 0	52 6	55 0	56 0
Australian	1st	49 0	49 0	47 0	46 6	46 6	—
Argentine	1st	—	49 0	50 0	49 0	—	45 0
PORK :—							
British	1st	57 0	58 0	56 0	55 6	56 0	49 6
	2nd	51 0	53 0	—	—	52 0	43 0
Foreign	1st	55 6	53 6	54 0	54 0	—	44 6

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.						Barley.						Oats.					
	1903.		1904.		1905.		1903.		1904.		1905.		1903.		1904.		1905.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7 ...	24	11	26	6	30	4	24	1	22	6	24	4	17	0	15	7	16	3
,, 14 ...	24	11	26	11	30	4	24	1	22	3	24	6	16	10	15	9	16	3
,, 21 ...	25	0	27	3	30	5	24	1	22	4	25	0	16	11	15	11	16	5
,, 28 ...	25	4	26	11	30	6	24	3	22	3	25	1	17	0	15	8	16	7
Feb. 4 ...	25	6	26	9	30	6	23	9	22	4	25	0	16	11	15	11	16	7
,, 11 ...	25	6	26	8	30	7	23	7	22	2	25	2	17	1	15	9	16	8
,, 18 ...	25	4	26	11	30	5	23	4	22	7	25	2	17	1	16	0	16	9
,, 25 ...	25	3	27	10	30	10	23	2	22	4	25	0	17	1	16	3	16	10
Mar. 4 ...	25	3	28	8	30	8	23	1	22	6	25	2	17	1	16	5	16	10
,, 11 ...	25	1	29	1	30	9	22	10	22	5	25	2	17	0	16	8	16	10
,, 18 ...	25	1	28	6	30	10	22	9	22	9	24	11	16	10	16	7	16	10
,, 25 ...	25	2	28	2	30	9	22	4	22	8	25	2	17	0	16	7	17	0
Apl. 1 ...	25	3	27	11	30	9	22	6	22	10	25	1	17	0	16	6	16	11
,, 8 ...	25	4	27	10	30	9	21	10	22	5	25	6	17	2	16	5	17	0
,, 15 ...	25	6	27	9	30	8	21	6	22	6	24	3	17	3	16	4	17	6
,, 22 ...	26	1	27	9	30	8	21	9	22	0	24	4	17	9	16	4	17	5
,, 29 ...	26	10	27	8	30	9	22	1	21	1	24	4	18	0	16	3	17	9
May 6 ...	27	6	27	4	30	8	21	10	20	8	25	3	18	2	16	7	18	0
,, 13 ...	27	9	27	1	30	8	22	5	19	10	24	10	18	4	16	6	18	3
,, 20 ...	27	10	26	9	30	10	23	7	20	4	24	8	18	5	16	7	18	5
,, 27 ...	27	8	26	9	30	11	23	7	19	8	24	4	18	5	16	7	18	8
June 3 ...	27	6	26	10	31	3	23	10	18	8	23	6	18	4	16	8	19	1
,, 10 ...	27	8	26	6	31	4	21	5	18	5	24	0	18	7	16	10	18	11
,, 17 ...	27	6	26	5	31	7	20	7	18	2	26	0	18	3	16	8	19	1
,, 24 ...	27	6	26	5	31	7	22	0	19	2	23	9	18	6	16	10	18	10
July 1 ...	27	9	26	4	31	8	20	7	18	8	23	2	18	6	17	1	19	7
,, 8 ...	28	1	26	6			19	11	19	8			18	3	17	1		
,, 15 ...	28	3	26	10			20	5	18	9			18	7	17	6		
,, 22 ...	28	7	27	7			20	10	18	10			18	5	17	6		
,, 29 ...	28	11	28	0			21	0	19	9			18	6	17	10		
Aug. 5 ...	29	3	28	3			20	1	19	9			18	8	17	10		
,, 12 ...	29	11	28	4			21	3	19	9			18	10	17	7		
,, 19 ...	29	9	28	8			20	4	22	5			18	6	16	7		
,, 26 ...	30	0	29	5			22	3	23	2			18	7	16	5		
Sept. 2 ...	30	3	30	2			22	5	25	3			18	5	16	3		
,, 9 ...	28	6	30	0			22	4	24	10			17	0	16	1		
,, 16 ...	27	5	29	7			24	2	24	9			16	4	15	11		
,, 23 ...	27	0	29	10			24	0	25	10			16	2	15	9		
,, 30 ...	26	3	29	10			23	9	25	5			15	9	15	8		
Oct. 7 ...	25	10	30	2			23	8	25	6			15	6	15	9		
,, 14 ...	25	8	30	5			23	9	25	4			15	5	15	8		
,, 21 ...	25	10	30	4			23	7	25	5			15	8	15	11		
,, 28 ...	26	0	30	6			24	2	24	11			15	8	15	10		
Nov. 4 ...	26	4	30	6			24	3	25	0			15	9	16	0		
,, 11 ...	26	6	30	3			24	6	24	6			15	9	15	11		
,, 18 ...	26	9	30	2			24	3	24	5			15	10	16	0		
,, 25 ...	26	6	30	5			23	11	24	4			15	11	16	1		
Dec. 2 ...	26	8	30	4			23	9	24	6			15	9	16	2		
,, 9 ...	26	7	30	4			23	2	24	4			15	9	16	2		
,, 16 ...	26	9	30	4			23	0	24	4			15	7	16	2		
,, 23 ...	26	5	30	3			22	5	24	7			15	6	16	1		
,, 30 ...	26	3	30	4			22	1	24	8			15	5	16	2		

AVERAGE PRICES of **Wheat, Barley, and Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	May ...	35 11	40 10	21 11	24 11	16 5	20 7
	June ...	34 9	41 0	21 5	25 3	16 0	21 6
Paris:	May ...	35 11	42 6	20 9	25 10	16 5	22 4
	June ...	34 7	42 5	20 5	26 3	15 11	23 1
Belgium:	May ...	30 0	34 4	21 5	23 10	15 6	21 2
Berlin:	April ...	38 1	37 6	—	—	17 7	19 8
	May ...	38 4	38 2	—	—	17 4	19 9
Breslau:	April ...	37 6	35 7	22 3	26 5	16 3	19 8
	May ...	37 3	35 3	22 3	25 7	16 2	19 4

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of June, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	26 7	32 2	18 2	22 5	17 3	19 11
Norwich	27 3	31 6	20 4	20 6	16 2	18 1
Peterborough ...	24 6	31 2	18 2	—	15 7	19 2
Lincoln	25 6	29 11	—	—	16 2	18 10
Doncaster	25 7	29 9	—	—	16 6	18 0
Salisbury	26 3	31 2	20 7	24 9	16 11	19 2

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	12 0	11 0	—	—	—	—	13 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	97 6	93 6	99 6	97 0	97 0	94 6	97 0	—
Danish ...	102 6	100 0	107 0	103 6	104 6	102 0	103 6	—
Russian ...	93 0	90 6	98 6	95 0	94 6	92 6	94 0	90 0
Australian ...	95 6	93 6	—	—	92 0	90 6	92 0	—
New Zealand ...	97 0	95 0	—	—	97 6	95 6	97 0	—
CHEESE :—								
British, Cheddar	74 0	60 0	—	—	72 0	66 0	52 6	49 6
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	56 0	49 0	56 0	50 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	55 0	53 0	—	—	50 0	48 0	49 0	47 0
BACON :—								
Irish	68 0	65 0	66 0	61 0	68 0	63 0	66 6	64 0
Canadian ...	57 0	54 0	58 0	56 0	55 0	50 6	58 0	54 0
HAMS :—								
Cumberland ...	100 0	82 0	—	—	—	—	—	—
Irish	100 0	82 0	—	—	—	—	100 6	90 6
American (long cut) ...	52 6	49 0	49 0	45 0	52 0	46 6	54 0	51 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	10 1	9 1	—	—	—	—	—	—
Irish	9 0	7 8	7 4	6 10	7 5	6 6	7 6	6 8
Danish ...	8 10	7 7	8 11	6 11	8 8	8 4	8 4	7 2
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	43 6	38 6	49 0	44 6	51 6	—	—	—
Main Crop ...	63 6	55 0	—	—	61 6	56 6	—	—
Up-to-Date ...	60 6	52 0	78 6	61 6	53 6	48 0	45 0	40 0
HAY :—								
Clover	81 0	72 6	87 6	76 6	80 0	67 6	74 0	67 6
Meadow ...	70 6	63 6	76 6	66 6	—	—	71 0	65 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	105	211	422	798
Swine Slaughtered as diseased or exposed to infection ...	514	741	2,024	3,863
Anthrax :—				
Outbreaks	89	71	535	527
Animals attacked	113	97	771	818
Glanders (including Farcy) :—				
Outbreaks	127	161	621	769
Animals attacked	193	269	1,081	1,387
Sheep-Scab :—				
Outbreaks	11	22	643	1,056

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	8	28	18	73
Swine Slaughtered as diseased or exposed to infection ...	138	631	467	1,873
Anthrax :—				
Outbreaks	—	—	2	2
Animals attacked	—	—	2	2
Glanders (including Farcy) :—				
Outbreaks	3	1	12	5
Animals attacked	9	2	34	21
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	8	10	222	365

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XII. No. 5.

AUGUST, 1905. [NEW SERIES.]

GROWTH OF CHICKENS AND COST OF REARING.

During the spring of 1904 a series of experiments and observations was made at the College Poultry Farm, Theale, in connection with the University College, Reading, as to the growth of chickens and cost of rearing, commencing in February and concluding on May 31st of that year. These experiments, which were recorded in a report published July, 1904, gave comparative figures as to two lots of chickens with thirty birds in each, namely, thirty white Wyandottes and thirty cross-breds.

In order to check the results then obtained, a further series of experiments was commenced in March, 1905, and concluded on July 5th of the same year. But in this case, four lots of chickens were kept under observation. The mortality in the chickens was very slight, only one death occurring in lots 1 (April 15th), 2 (May 15th), and 3 (June 16th), and no deaths in lot 4. As seen below, these losses were regarded as part of the cost of rearing.

Management.—The chickens were treated throughout in identically the same manner:—

1. All the chickens were hatched from eggs produced by stock kept on the College Poultry Farm;

2. The hatching was exclusively in incubators of the same class;

3. Each lot was hatched on the same day (April 4th, 1905)

4. When dried off (twenty-four hours after hatching), each was accommodated in a brooder of the same class;

5. For two weeks they were kept in heated brooders without grass runs; for two weeks longer in heated brooders with limited grass runs; and for one week longer in the brooders without heat;

6. When five weeks old the cold brooders were removed, and the chickens were placed in a large house without perches, remaining there until the end of the full period of twelve weeks; these houses were in large grass runs;

7. During the whole period they were fed in identically the same manner; and

8. No attempt was made to force growth. The birds were treated in the natural way.

The chickens were fed a week longer than in 1904, as they did not make such rapid growth, doubtless due to the very dry weather in May and June.

Location. – For the first five weeks the brooders were kept in a paddock on the farm, and moved to fresh ground daily. Throughout the entire time, careful attention was paid to cleanliness.

The houses, to which they were removed at the end of five weeks, varied somewhat, but each contained about 234 cubic feet of air space. The runs contained about 280 superficial yards each, or about 9 rods, and were laid down in grass. They were well sheltered on the north by large chestnut trees, and planted with fruit trees, but additional shelter was provided by means of hurdles.

Cost of Eggs and Working.—At the time when the eggs were placed in the incubators (March 13th) their market value was slightly under 1s. per dozen, and in the following calculations they have been estimated at one penny each. During the season 1904–5 the average of hatching by machine has been 75·82 per cent. of fertile eggs,* but for the sake of comparison we have taken the same average as in 1903–4, namely, 70 per cent. Thus, nearly forty-three eggs were required to produce thirty chickens at the time of hatching, and the egg cost of each chicken when hatched was 1·43d.

The cost for oil burnt in a 100 or 120-egg incubator is about 3d. per week (using Majestic oil at 8d. a gallon), and, allowing four weeks for regulation and complete hatching, this gives a total of 12d. Providing for infertiles taken out, and taking two lots in one machine, a total of 6d. per lot is reached, to be divided in accordance with the number reared. One brooder

* See Report on "Artificial Incubation," *Journal*, May, 1905, pp. 87–96.

was used for each lot, and the cost of oil consumed in lamps was 1·25d. per week each; that is 5d. for the four weeks.

Foods and Feeding.—The dry feeding system has again been adopted, and the following report shows the value of that method. The same mixtures were supplied as in the previous year, except that wheat was substituted for Mixture B. at the end of the eighth week. The dry feed is scattered among the litter, and the birds have to scratch in finding it, thus obtaining constant and beneficial exercise.

The following foods were employed during the experiment:—

A.—DRY FEED MIXTURE (FIRST FOUR WEEKS).

	By weight.		By weight.
Wheat (cracked)	3 parts	Broken maize	1 part
Dari	2 ,,	Hempseed or Buckwheat ...	1 ,,
Canary seed	2 ,,	Rice	1 ,,
Oatmeal	2 ,,	Meat	1 ,,
Millet	2 ,,	Grit	1 ,,

To make 1 cwt., 1 part = 7 lb. Cost, 10s. 8d. per cwt., 1·14d. per lb.

B.—DRY FEED MIXTURE (AFTER FOUR WEEKS).

	By weight.		By weight.
Wheat (cracked)	3 parts	Hempseed	1 part
Broken maize	2 ,,	Meat	1 ,,
Dari	2 ,,	Linseed...	1 ,,
Buckwheat	2 ,,	Grit and oyster shell	1 ,,
Rice	1 ,,		

Cost, 7s. 6d. per cwt., 0·8d. per lb.

C.—SOFT FOOD (AFTER EIGHT WEEKS).

	By weight.		By weight.
Barley meal	4 parts	Meat	1 part
Toppings	4 ,,		

Cost, 7s. 9d. per cwt., 0·83d. per lb.

D.—BISCUIT MEAL.

Spratt's Patent Chicken Meal, 18s. 4d. per cwt., 2d. per lb.

E.—WHEAT.

7s. per cwt., ¾d. (0·75d.) per lb.

The prices charged are those at which the above foods can be purchased generally.

In feeding, the soft food was supplied in sufficient quantities to be cleared up at once; the hard corn was left for about half to three-quarters of an hour, and then removed.

Green food was supplied, but when the birds were out on the grass it was seldom eaten. It was given after hard food, so that we could arrive at the weight of food consumed.

General Treatment.—Table I. shows (1) where the chickens were accommodated, (2) the temperature of sleeping compartment during the first four weeks, (3) the outside conditions, and (4) the times of feeding and food supplied.

TABLE I.—RECORD OF TREATMENT OF CHICKENS.

Date.	Where Kept.	Temperature of Brooder.	Outside Conditions.	Food Supplied (Mixtures, &c.).			
April 5–12 ...	Brooder...	90° F.	No grass	A in litter			
,, 13–19 ...	,,	85° F.	,,	,,			
,, 20–26 ...	,,	80° F.	Small grass run	,,			
,, 27–May 3	,,	75° F.	,,	,,			
				7 a.m.	10 a.m.	2.30 p.m.	5 p.m.
May 4–10 ...	Cold brooder	—	,,	D	B	D	B
,, 11–17 ...	House ...	—	Free grass run	D	B	D	B
,, 18–24 ...	,,	—	,,	D	B	D	B
,, 25–31 ...	,,	—	,,	D	B	D	B
				7 a.m.	12 noon.	5 p.m.	
June 1–7 ...	,,	—	,,	C	E	E	
,, 8–14 ...	,,	—	,,	C	E	E	
,, 15–21 ...	,,	—	,,	C	E	E	
,, 22–28 ...	,,	—	,,	C	E	E	
,, 29–July 5	,,	—	,,	C	E	E	

Description of Birds.—For the purpose of these experiments, four lots of chickens were chosen, taken as hatched from the incubators, without any attempt at selection, namely, (1) thirty white Wyandottes, (2) thirty Faverolles, (3) thirty Buff Orpingtons, and (4) thirty cross-bred (consisting of fifteen Houdan-Buff Orpingtons and fifteen Indian Game-Buff Orpingtons).

It was intended to have again included Faverolle-Buff Orpingtons, the cross that succeeded so well in 1904, but none were available at the time the experiment was commenced.

The particulars of the experiments with each lot are given separately.

EXPERIMENT NO. 1.—WHITE WYANDOTTES.

The gross consumption and cost of each class of food are shown in Table II., and the average weekly weights and increases, with atmospheric conditions, in Table III.

TABLE II.—30 WHITE WYANDOTTES. GROSS CONSUMPTION AND COST OF FOOD.

Week ending.	Food Consumed.						Cost of Food.						Average Weekly Cost per bird	Cost per lb. of Increased Weight
	A.	B.	C.	D.	E.	Total.	A.	B.	C.	D.	E.	Total.		
1905.	lb.	lb	lb.	lb.	lb.	lb.	d.	d.	d.	d.	d.	d.	d.	d.
April 12	2·3	—	—	—	—	2·3	2·62	—	—	—	—	2·62	0·08	4·64
,, 19	5·9	—	—	—	—	5·9	6·72	—	—	—	—	6·72	0·22	5·6
,, 26	8·0	—	—	—	—	8·0	9·1	—	—	—	—	9·1	0·31	5·1
May 3	10·1	—	—	—	—	10·1	11·5	—	—	—	—	11·5	0·90	1·63
,, 10	—	14·5	—	1·0	—	15·5	—	11·6	—	2·0	—	13·6	0·47	4·42
,, 17	—	18·25	—	2·0	—	20·25	—	14·6	—	4·0	—	18·6	0·64	5·44
,, 24	—	17·5	—	2·5	—	20·0	—	14·0	—	5·0	—	19·0	0·65	4·96
,, 31	—	18·75	—	2·5	—	21·25	—	15·0	—	5·0	—	20·0	0·69	2·51
June 7	—	—	2·0	—	17·5	19·5	—	—	1·66	—	13·12	14·78	0·51	2·4
,, 14	—	—	4·0	—	18·5	22·5	—	—	3·32	—	13·88	17·2	0·59	3·52
,, 21	—	—	4·5	—	19·5	24·0	—	—	3·73	—	14·62	18·35	0·63	2·64
,, 28	—	—	4·0	—	22·0	26·0	—	—	3·32	—	16·5	19·82	0·68	8·56
July 5	—	—	4·75	—	23·5	28·25	—	—	3·94	—	17·62	21·56	0·74	2·56
Grit for period ...	—	—	—	—	—	14·0	—	—	—	—	—	5·25	0·18	—
Total						237·55 lb.	...	..	...	...	...	d. 198·1	6·8 d.	3·45 d.

Total food consumed ... ... 2 cwt. 0 qr. 13 lb. 1 oz.
Total cost of food ... ... 16s. 6d.
Weight of food consumed for each lb. gained ... ... 4·16 lb.
Average cost of food per bird... ... ... 6·8d.
Cost of increased weight per lb. gained ... ... 3·45d.

TABLE III.—THIRTY WHITE WYANDOTTES.

Average Weekly Weights and Increases, with Atmospheric Conditions.

Week ending.	Average Weights.	Average Gain in Weight.	Total Average Gain in Weight to Date.	Temperature of Outside Atmosphere. Max.	Temperature of Outside Atmosphere. Min.	Remarks.
1905.	Oz.	Oz.	Oz.	Deg. F.	Deg. F.	
April 5 ...	1·33	—	—	—	—	—
,, 12 ...	1·63	0·3	0·3	54	43	Dull and sunless.
,, 19 ...	2·34	0·71	1·0	46	41	Some rain.
,, 26 ...	3·31	0·97	1·98	55	47	Very dry.
May 3 ...	7·17	3·86	5·84	61	37	do.
,, 10 ...	8·83	1·66	7·5	66	38	do.
,, 17 ...	10·69	1·86	9·36	66	35	Little rain.
,, 24 ...	12·79	2·1	11·46	62	34	Dry.
,, 31 ...	17·17	4·38	15·84	85	53	Hot and dry.
June 7 ...	20·48	3·31	19·15	75	46	do.
,, 14 ...	23·14	2·66	21·81	84	47	Heavy rains.
,, 21 ...	26·96	3·83	25·63	67	55	Some rain.
,, 28 ...	28·24	1·28	26·91	84	52	Very dry.
July 5 ...	32·9	4·66	31·57	70	53	do.

From Table III. it will be seen that the average gain in weight in the first four weeks, including the loss of the bird which died on April 15th, was 5·8 oz., in the second four weeks 10 oz., and in the final five weeks 15·7 oz. The average cost per bird in the first four weeks was 0·92d., in the second four weeks 2·4d., and in the final five weeks (inclusive of grit for the entire period) 3·5d. The climatic conditions, as shown in the above Table, do not afford any explanation of the variations in growth. On the whole, the night temperature was well maintained.

The weight of the thirty birds when twenty-four hours old was 2 lb. 8 oz. At the close of the experiment, the twenty-nine birds, then thirteen weeks old, weighed 59 lb. 10 oz., so that the average gain in weight was 1 lb. 15½ oz.

With regard to their respective weights at thirteen weeks old, 29 birds averaged 2 lb. 1 oz. The 14 cockerels averaged 2 lb. 2 oz., and the 15 pullets averaged 2 lb. The greatest gain was 2 lb. 6 oz., and the least gain 1 lb. 12 oz.

Variations in Growth.—The birds varied in weight on July 5th from 29 oz. to 39 oz., as follows :—Five weighed 29 oz. each ; one, 30 oz. ; four, 31 oz. each ; four, 32 oz. ; five, 33 oz. ; four, 34 oz. ; three, 37 oz. ; two, 38 oz. each ; and 1, 39 oz.

Whilst the cockerels made the greater gain, exceeding the average by ·74 oz., the pullets were not so far behind as might have been expected, only falling below the average by ·7 oz. Thus the growth was not so good as in 1904, when one cockerel reached 3 lb. and one pullet 2 lb. 12 oz. in twelve weeks. In that year the general average of this breed was slightly over 2 lb. 4 oz., and of cockerels nearly 2 lb. 8 oz., but the pullets did not come out so well, as they averaged only about 1 lb. 15¾ oz.

EXPERIMENT NO. 2.—FAVEROLLES.

The following Tables give the details relating to this experiment in the same manner as in experiment No. 1 :—

TABLE IV.—THIRTY FAVEROLLES.

Average Weekly Weights and Increases, with Atmospheric Conditions.

Week ending.	Average Weight.	Average Gain in Weight.	Total Average Gain in Weight to Date.	Temperature of Outside Atmosphere.		Remarks.
				Max.	Min.	
1905.	Oz.	Oz.	Oz.	Deg. F.	Deg. F.	
April 5 ...	1·23	—	—	—	—	—
,, 12 ...	1·7	0·47	0·47	54	43	Dull and sunless.
,, 19 ...	2·93	1·23	1·7	46	41	Some rain.
,, 26 ...	4·4	1·47	3·17	55	47	Very dry.
May 3 ...	7·47	3·07	6·24	61	37	do.
,, 10 ...	8·9	1·43	7·67	66	38	do.
,, 17 ...	11·1	2·2	9·87	66	35	Little rain.
,, 24 ...	13·13	2·03	11·90	62	34	Dry.
,, 31 ...	17·31	4·18	16·08	85	53	Hot and dry.
June 7 ...	20·07	2·75	18·84	75	46	do.
,, 14 ...	23·83	3·76	22·59	84	47	Heavy rains.
,, 21 ...	27·03	3·21	25·80	67	55	Some rain.
,, 28 ...	30·03	3·00	28·80	84	52	Very dry.
July 5 ...	34·03	4·00	32·80	70	53	do.

Table IV. shows that the average gain in the first four weeks was 6·2 oz., in the second four weeks (inclusive of the bird which died on May 15th) 9·8 oz., and in the final five weeks, 16·7 oz. The average cost per bird in the first four weeks was 0·95d., in the second four weeks 2·4d., and in the final five weeks (inclusive of grit for the entire period) 3·3d. It will be noted that in this experiment the ratio of growth does not appear to have been influenced by the dryness to any serious extent, or by the variations of temperature.

TABLE V.—30 FAVEROLLES. GROSS CONSUMPTION AND COST OF FOOD.

Week ending.	Food Consumed.						Cost of Food.						Average Weekly Cost per bird.	Cost per lb. of Increased Weight.
	A.	B.	C.	D.	E.	Total.	A.	B.	C.	D.	E.	Total.		
1905.	lb.	lb.	lb.	lb.	lb.	lb.	d.	d.	d.	d.	d.	d.	d.	d.
Apr 12	2·1	—	—	—	—	2·1	2·4	—	—	—	—	2·4	0·08	2·72
,, 19	6·0	—	—	—	—	6·0	6·9	—	—	—	—	6·9	0·23	3·04
,, 26	9·0	—	—	—	—	9·0	10·26	—	—	—	—	10·26	0·34	3·68
May 3	10·5	—	—	—	—	10·5	11·97	—	—	—	—	11·97	0·34	2·08
,, 10	—	14·0	—	1·5	—	15·5	—	11·2	—	3·0	—	14·2	0·47	5·28
,, 17	—	17·5	—	2·0	—	19·5	—	14·0	—	4·0	—	18·0	0·62	5·12
,, 24	—	18·5	—	2·25	—	20·75	—	14·8	—	4·5	—	19·3	0·67	5·12
,, 31	—	18·25	—	2·0	—	20·25	—	14·6	—	4·0	—	18·6	0·64	2·4
June 7	—	—	2·0	—	17·75	19·75	—	—	1·66	—	13·31	14·97	0·52	3·04
,, 14	—	—	4·0	—	18·0	22·0	—	—	3·32	—	13·5	16·82	0·58	2·4
,, 21	—	—	4·25	—	19·25	23·5	—	—	3·53	—	14·44	17·97	0·62	3·04
,, 28	—	—	5·25	—	19·0	24·25	—	—	4·36	—	14·25	18·61	0·64	3·36
July 5	—	—	5·75	—	21·0	26·75	—	—	4·77	—	15·75	20·52	0·71	2·88
Grit for period ...	—	—	—	—	—	14·0	—	—	—	—	—	5·25	0·18	—
Total						233·85 lb.	...	...	...	...	...	195·77 d.	6·75 d.	3·3 d.

Total food consumed ... ... 2 cwt. 0 qr. 9 lb. 1 oz.
Total cost of food ... ... 16s. 3¾d.
Weight of food consumed for each lb. gained ... ... 3·9 lb.
Average cost of food per bird ... ... 6¾d.
Cost of increased weight per lb. gained ... ... 3·3d.

The weight of the thirty birds, twenty-four hours old, was 2 lb. 5 oz. At the close of the experiment the remaining twenty-nine birds, thirteen weeks old, weighed 61 lb. 11 oz., or an average gain of 2 lb. 0¾ oz.

Variations in Growth.—The birds varied in weight, on July 5th, from 26 oz. to 42 oz., as follows:—One weighed 26 oz.; two, 27 oz. each; two, 29 oz.; one, 32 oz.; three, 33 oz. each; seven, 34 oz.; four, 36 oz.; five, 37 oz.; one, 38 oz.; one, 39 oz.; two, 42 oz. each. As to their respective weights at thirteen weeks old, 29 birds averaged 2 lb. 2 oz. The 15 cockerels averaged 2 lb. 2 oz., and the 14 pullets averaged 2 lb. 2 oz. The greatest gain was 2 lb. 9 oz., and the least gain 1 lb. 9 oz.

In this experiment the cockerels did not grow as quickly as the pullets, falling below the average by one-third of an ounce, and the pullets exceeding the average by a little more than one-third of an ounce. As Faverolles were not included in 1904 comparisons cannot be made.

EXPERIMENT NO. 3.—BUFF ORPINGTONS.

The following Tables give the particulars of growth, &c., as in Nos. 1 and 2:—

TABLE VI.—30 BUFF ORPINGTONS.

Average Weekly Weights and Increases, with Atmospheric Conditions.

Week Ending.	Average Weight.	Average Gain in Weight.	Total Average Gain in Weight to Date.	Temperature of Outside Atmosphere. Max.	Temperature of Outside Atmosphere. Min.	Remarks.
1905.	Oz.	Oz.	Oz.	Deg. F.	Deg. F.	
April 5 ...	1·27	—	—	—	—	
,, 12 ...	1·43	0·16	0·16	54	43	Dull and sunless.
,, 19 ...	2·6	1·17	1·33	46	41	Some rain.
,, 26 ...	4·4	1·8	3·13	55	47	Very dry.
May 3 ...	6·93	2·53	5·66	61	37	do.
,, 10 ...	8·16	1·23	6·89	66	38	do.
,, 17 ...	8·93	0·77	7·66	66	35	Little rain.
,, 24 ...	10·73	1·8	9·46	62	34	Dry.
,, 31 ...	16·9	6·17	15·63	85	53	Hot and dry.
June 7 ...	20·7	3·8	19·43	75	46	do.
,, 14 ...	23·43	2·73	22·16	84	47	Heavy rains.
,, 21 ...	28·78	5·35	27·51	67	55	Some rain.
,, 28 ...	31·58	2·8	30·31	74	52	Very dry.
July 5 ...	34·83	3·25	33·56	70	53	do.

TABLE VII.—30 BUFF ORPINGTONS. GROSS CONSUMPTION AND COST OF FOOD.

Week ending.	Food Consumed.						Cost of Food.						Average Weekly Cost per bird.	Cost per lb. of Increased Weight.
	A.	B.	C.	D.	E.	Total.	A.	B.	C.	D.	E.	Total.		
1905.	lb.	lb.	lb.	lb.	lb.	lb.	d.	d.	d.	d.	d.	d.	d.	d.
April 12	2·19	—	—	—	—	2·19	2·5	—	—	—	—	2·5	0·08	8·0
,, 19	5·5	—	—	—	—	5·5	6·27	—	—	—	—	6·27	0·21	2·86
,, 26	8·5	—	—	—	—	8·5	9·7	—	—	—	—	9·7	0·32	2·88
May 3	9·25	—	—	—	—	9·25	10·5	—	—	—	—	10·5	0·35	2·2
,, 10	—	11·5	—	1·25	—	12·75	—	9·2	—	2·5	—	11·7	0·4	5·05
,, 17	—	14·5	—	1·75	—	16·25	—	11·6	—	3·5	—	15·1	0·5	10·5
,, 24	—	15·75	—	2·0	—	17·75	—	12·6	—	4·0	—	16·6	0·55	4·9
,, 31	—	18·25	—	2·0	—	20·25	—	14·6	—	4·0	—	18·6	0·62	1·6
June 7	—	—	1·75	—	18·75	20·5	—	—	1·45	—	14·06	15·51	0·52	2·17
,, 14	—	—	4·0	—	19·0	23·0	—	—	3·32	—	14·25	17·57	0·59	3·42
,, 21	—	—	5·25	—	18·75	24·0	—	—	4·36	—	14·06	18·42	0·63	2·25
,, 28	—	—	6·0	—	19·75	25·75	—	—	4·98	—	14·82	19·8	0·68	3·86
July 5	—	—	6·25	—	21·0	27·25	—	—	5·19	—	15·75	20·94	0·72	3·54
Grit for period ...	—	—	—	—	—	14·0	—	—	—	—	—	5·25	0·18	—
Total						226·94 lb.	... ...					d. 188·46	6·5 d.	3·1d.

Total food consumed ... ... 2 cwt. 0 qr. 2 lb. 2 oz.
Total cost of food ... ... 15s. 8½d.
Weight of food consumed for each lb. gained ... ... 3·72 lb.
Average cost of food per bird ... ... 6½d.
Cost of increased weight per lb. gained ... ... 3·1d.

Table VI. indicates that the average gain in weight in the first four weeks was 5·6 oz., in the second four weeks 10 oz., and in the final five weeks, inclusive of the bird which died on June 16th, 18·0 oz. The average cost per bird in the first four weeks was 1·4d., in the second four weeks 2d., and in the final five weeks, inclusive of grit for the entire period, 3·2d. It will be seen that the greatest growth was in the hot and dry week ending May 31st, and the next greatest in the cooler and moister week ending June 21st; whilst the least average growth, after the first week, was in the week ending May 17th, when cooler conditions prevailed.

The weight of thirty birds, twenty-four hours old, was 2 lb. 6 oz. At the close of the experiment, twenty-nine birds, thirteen weeks old, weighed 63 lb. 2 oz., showing an average gain in weight of 2 lb. 1½ oz.

Variations in Growth.—The birds varied in weight on July 5th from 24 oz. to 39 oz., as follows:—One weighed 24 oz.; one, 27 oz.; three, 29 oz. each; one, 30 oz.; three, 31 oz. each; three, 32 oz.; four, 33 oz.; two, 34 oz.; two, 35 oz.; one, 36 oz.; five, 37 oz. each; one, 38 oz.; two, 39 oz. each.

In this case it was found that 29 birds averaged nearly 2 lb. 3 oz. The 18 cockerels averaged 2 lb. 3 oz., and the 11 pullets averaged 1 lb. 13 oz. The greatest gain was 2 lb. 6 oz., and the least gain 1 lb. 7 oz.

In this experiment the cockerels exceeded the average by 0·38 oz., whereas the pullets fell below the average by 3·83 oz. Buff Orpingtons were not included in the experiments of 1904.

EXPERIMENT NO. 4.—CROSS-BREDS.

The following tables give the particulars of growth, &c., as in Nos. 1 to 3. This lot of thirty birds consisted of fifteen Houdan-Buff Orpingtons and fifteen Indian Game-Buff Orpingtons.

From Table IX. it is found that the cross-breds did not grow nearly so fast as either of the pure-breds, but reference to Table VIII. will show that there was an equal reduction in quantity and cost of food consumed. The average gain in the first four weeks was 4·3 oz., in the second four weeks 10·2 oz., and in the final five weeks 13·07 oz.; and the average cost per bird in the first four weeks was 0·8d., in the second

TABLE VIII.—30 CROSS-BREDS. GROSS CONSUMPTION AND COST OF FOOD.

Week ending.	Food Consumed.						Cost of Food.						Average Weekly Cost per bird.	Cost per lb. of Increased Weight.
	A.	B.	C.	D.	E.	Total.	A.	B.	C.	D.	E.	Total.		
1905.	lb.	lb.	lb.	lb.	lb.	lb.	d.	d.	d.	d.	d.	d.	d.	d.
April 12	2·1	—	—	—	—	2·1	2·4	—	—	—	—	2·4	0·08	2·94
,, 19	6·12	—	—	—	—	6·12	6·97	—	—	—	—	6·97	0·23	5·05
,, 26	8·5	—	—	—	—	8·5	9·69	—	—	—	—	9·69	0·32	5·55
May 3	7·12	—	—	—	—	7·12	8·12	—	—	—	—	8·12	0·27	1·9
,, 10	—	9·25	—	0·75	—	10·0	—	7·4	—	1·5	—	8·9	0·3	2·68
,, 17	—	16·75	—	1·25	—	18·0	—	13·4	—	2·5	—	15·9	0·53	4·98
,, 24	—	17·75	—	1·5	—	19·0	—	14·2	—	3·0	—	17·2	0·57	5·5
,, 31	—	18·5	—	2·0	—	20·5	—	14·8	—	4·0	—	18·8	0·63	1·65
June 7	—	—	2·25	—	18·75	21·0	—	—	1·87	—	14·06	15·93	0·53	3·8
,, 14	—	—	3·0	—	18·0	21·0	—	—	2·49	—	13·5	15·99	0·53	2·56
,, 21	—	—	3·5	—	19·5	23·0	—	—	2·9	—	14·6	17·5	0·58	7·56
,, 28	—	—	3·25	—	19·0	22·25	—	—	2·7	—	14·25	16·95	0·56	3·08
July 5	—	—	4·0	—	19·75	23·75	—	—	3·32	—	14·81	18·13	0·6	2·93
Grit for period ...	—	—	—	—	—	14·0	—	—	—	—	—	5·25	0·17	—
Total						216·34 lb. ...	...	...	...	...	...	d. 177·73	5·92 d.	3·3 d.

Total food consumed ... ... 1 cwt. 3 qr. 20 lb. $0\frac{1}{2}$ oz.
Total cost of food ... ... 14s. $9\frac{3}{4}$d.
Weight of food consumed for each lb. gained ... ... 4·03 lb.
Average cost of food per bird ... ... 5·92d.
Cost of increased weight per lb. gained ... ... 3·3d.

four weeks 2d., and in the final five weeks, inclusive of grit for the entire period, 3d. All the birds in this lot were reared, and thus the average gain should have been greater, but several, two especially, made no growth for part of the time, and thus reduced the average considerably.

The weight of thirty birds, twenty-four hours old, was 2 lb. 5 oz.; which was increased, at the close of the experiment, to 56 lb., showing an average gain of 1 lb. 12⅔ oz.

TABLE IX.—30 CROSS-BREDS.

Average Weekly Weights and Increases, with Atmospheric Conditions.

Week Ending.	Average Weight.	Average Gain in Weight.	Total Average Gain in Weight to Date.	Temperature of Outside Atmosphere.		Remarks.
				Max.	Min.	
1905.	Oz.	Oz.	Oz.	Deg. F.	Deg. F.	
April 5 ...	1·23	—	—	—	—	
,, 12 ...	1·66	0·43	0·43	54	43	Dull and sunless.
,, 19 ...	2·4	0·74	1·17	46	41	Some rain.
,, 26 ...	3·33	0·93	2·1	55	47	Very dry
May 3 ...	5·6	2·27	4·37	61	37	do.
,, 10 ...	7·36	1·76	6·13	66	38	do.
,, 17 ...	9·06	1·7	7·83	66	35	Little rain.
,, 24 ...	10·73	1·67	9·5	62	34	Dry.
,, 31 ...	16·8	6·07	15·57	85	53	Hot and dry.
June 7 ...	19·03	2·23	17·8	75	46	do.
,, 14 ...	22·36	3·33	21·13	84	47	Heavy rains.
,, 21 ...	23·63	1·27	22·4	67	55	Some rain.
,, 28 ...	26·63	3·00	25·4	84	52	Very dry.
July 5 ...	29·86	3·23	28·63	70	53	do.

Variations in Growth.—The birds in this experiment varied greatly, from 19 oz. to 37 oz., as follows:—One weighed 19 oz.; one, 21 oz.; one, 22 oz.; one, 23 oz.; one, 24 oz.; one, 26 oz.; five, 27 oz. each; one, 28 oz.; three, 29 oz. each; five, 32 oz.; two, 33 oz.; three, 34 oz.; two, 36 oz.; three, 37 oz. each, thus emphasising the importance of selecting the right breed or cross for attainment of early maturity.

The average weight of the thirty cross-breds was 1 lb. 14 oz.; 13 cockerels averaging 1 lb. 15 oz., and 17 pullets 1 lb. 13 oz. The 15 Houdan-Buff Orpingtons averaged 1 lb. 13 oz., and the 15 Indian Game-Buff Orpingtons 1 lb. 15 oz. The greatest gain was 2 lb. 4 oz., and the least gain 1 lb. 2 oz.

This concludes the particulars relating to each of the lots

included in the experiment, and it is now possible to make some comparisons of the results obtained by the different breeds.

COMPARISONS.

The cost of the chickens at thirteen weeks old is arrived at as follows:—

——	Lot 1 29 White Wyandottes	Lot 2 29 Faverolles.	Lot 3 29 Buff Orpingtons.	Lot 4 30 Cross-breds.
	d.	d.	d.	d.
Initial cost of egg ...	1·48	1·48	1·48	1·43
Cost of working incubator	0·21	0·21	0·21	0·20
Cost of working brooder	0·17	0·17	0·17	0·16
Cost of food (average)...	6·8	6·75	6·5	5·92
Average cost per bird ...	8·66	8·61	8·36	7·71

In 1904 the cost at twelve weeks old of White Wyandottes was 9·1d., and of the cross-breds 9·09d. It will be seen from the above that this year the cost is less, although the birds were fed a week longer, and that the cross-breds are below the pure-breds, but that is partly explainable by the fact that all Lot 4 were reared. In the above no allowance is made for interest on capital, rent or labour, as these would vary considerably, and can be calculated by poultry-keepers in accordance with their special conditions. The actual cost, inclusive of eggs, working incubator and brooder, and food, works out as follows:—White Wyandottes and Faverolles, a fraction over 8½d.; Buff Orpingtons, 8¼d.; and cross-breds a little over 7½d.

An interesting point is the comparison of the weights of the birds of each breed at the end of each successive week, as given in the following table. It will be seen that there was very great variation in the growth in different weeks, though, generally speaking, similar fluctuations in growth were made in the same weeks by all the breeds.

Thus the fourth week was a week of considerable growth in each case; again the eighth week was marked by a great increase in weight, while comparatively small increases occurred in the first three weeks, and again in the fifth, sixth and seventh weeks.

From the Table we find that whilst in pure-breds both Faverolles and Buff Orpingtons started with a smaller weight than the White Wyandottes, after the ninth week they forged ahead, and stood above at the end of the period. Nearly all the time the cross-breds were in the rear, in spite of the fact that not one of these died.

COMPARISONS OF WEIGHTS OF BREEDS.

Ages.	Total Weights.							
	White Wyandottes.		Faverolles.		Buff Orpingtons.		Cross-breds.	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
24 hours old...	2	8	2	5	2	6	2	5
8 days old ...	3	1	3	3	2	11	3	2
15 ,, ...	4	4	5	8	4	14	4	8
22 ,, ...	6	0	8	4	8	4	6	4
29 ,, ...	13	0	14	0	13	0	10	8
36 ,, ...	16	0	16	11	15	5	13	13
43 ,, ...	19	6	20	2	16	12	17	0
50 ,, ...	23	3	23	13	20	2	20	2
57 ,, ...	31	2	31	6	31	11	31	8
64 ,, ...	37	2	36	6	38	13	35	11
71 ,, ...	41	15	43	3	43	15	41	15
78 ,, ...	48	14	49	0	52	2	44	5
85 ,, ...	51	5	54	7	57	4	49	5
92 ,, ...	59	10	61	11	63	2	56	0

In the next Table are given the comparisons of the four lots.

GENERAL COMPARISONS.

—	White Wyandottes.	Faverolles.	Buff Orpingtons.	Cross-breds.
Total food consumed ...	237·55 lb.	233·85 lb.	226·94 lb.	216·34 lb.
Total cost of food ...	16s. 6d.	16s. 3¾d.	15s. 8½d.	14s. 9¾d.
Weight of food consumed for each pound gained	4·16 lb.	3·9 lb.	3·72 lb.	4·03 lb.
Average cost of food per bird	6·8d.	6·75d.	6·5d.	5·92d.
Cost of increased weight per pound	3·45d.	3·3d.	3·1d.	3·3d.
Average gain in weight	1 lb. 15½ oz.	2 lb. 0¾ oz.	2 lb. 0½ oz.	1 lb. 12⅔ oz.
Average weight: 13 weeks	2 lb. 1 oz.	2 lb. 2 oz.	2 lb. 3 oz.	1 lb. 14 oz.
Average weight: cockerels	2 lb. 1½ oz.	2 lb. 2 oz.	2 lb. 3 oz.	1 lb. 13½ oz.
Average weight: pullets	2 lb.	2 lb. 2 oz.	1 lb. 13 oz.	1 lb. 12½ oz.
Greatest gain	2 lb. 5½ oz.	2 lb. 8¾ oz.	2 lb. 5¾ oz.	2 lb. 3¾ oz.
Least gain	1 lb. 11½ oz.	1 lb. 8¾ oz.	1 lb. 6¾ oz.	1 lb. 1¾ oz.

As the greater part of the chickens raised were required for breeding stock or for later fattening, they were not killed on July 5th, and thus the gross profit cannot be stated. The experiment, however, shows the actual cost of hatching and rearing to thirteen weeks of 117 birds as follows:—

		£	s.	d.
29	White Wyandottes at 8·66d.	1	0	11
29	Faverolles at 8·61d.	1	0	9¾
29	Buff Orpingtons at 8·36d.	1	0	2½
30	Cross-breds at 7·71d....	0	19	3¼
117	Total cost	£4	1	2½

The total weight of chickens produced at thirteen weeks was 241 lb. 2 oz.

EDWARD BROWN.

REARING OF PIGEONS FOR MARKET.

Among the small rural industries which are useful in supplementing the incomes of the small holder and cottager is the raising of squabs for market and for home consumption. Several years' experience in breeding pigeons and in raising their young (squabs) for market have shown that the industry is one which may be compared in point of profit both with rabbit-breeding and bee-keeping, and one point in its favour is that it does not require much labour. The initial capital required, to make a beginning in a small way, is also insignificant, and, consequently, the industry comes within the reach of all, and even the poorest labourer is afforded a means of supplementing his scanty income.

The demand is in favour of large squabs, and this must be taken into consideration when selecting a breed, for not every breed of pigeons will produce sufficiently large squabs.

Best Breeds.—I have been engaged for over two years in making experiments, with the object of ascertaining which breed of pigeons might be kept and raised with greatest profit. Amongst the breeds included in the trials were: Homers, Runts, Dragoons, common pigeons, and cross-bred Homer-Dragoons and Runt-Dragoons. The Homers proved much superior to

the others in these experiments, and the yearly produce of ten pairs of Homers was sold at a higher price than the produce of an equal number of any other kind of pigeons.

The Homer is a clean, active, vigorous breed, which may be depended upon to produce eight to ten nests of young in a year, when proper care is taken. It is possible, by careful selection of the breeding stock, to raise Homer squabs which will weigh over eight pounds per dozen dead weight, at four weeks old, and the "eight-pound" squab is a really marketable article.

Runts and Dragoons will weigh over nine pounds a dozen, but they are not ready for killing until about five weeks old, and frequently they take a few days longer to become properly finished. This extra feeding detracts considerably from the profits, and hinders the old birds from going forward with their second nest. I have found the Homer-Dragoon cross next in value to the Homer, but Runts and Dragoons, either pure or cross-bred, are comparatively unprofitable, being big feeders as well as lazy and inactive, eating one and a half times as much as Homers. My experience with Runts is that they do not lay more than four or five nests of eggs in the year. Common pigeons are out of the question as producers of squabs for table, being too small, not very reliable as breeders, and lacking uniformity—a very necessary qualification when high prices are desired.

Mating Pigeons.—All the pigeons in a loft must be mated for breeding, and if there are any odd birds, either male or female, a separate apartment must be set aside for them. It is advisable to keep a few odd cocks and hens in a coop or large cage, for use in case the matings made do not give satisfactory results. Pigeons are monogamous, and when paired will not interfere with one another, but it is necessary sometimes to re-mate birds, when the birds which have been mated prove sterile or when the produce is not up to the desired standard.

In-breeding must be avoided when strong, healthy, large squabs are desired, but it is comparatively easy to arrange that the parent birds shall not be closely related when two or more lofts are kept. Pigeons breed well for three or four years, and it is only necessary to mate up a pair of unrelated young birds to replace a pair which show signs of becoming worthless. The

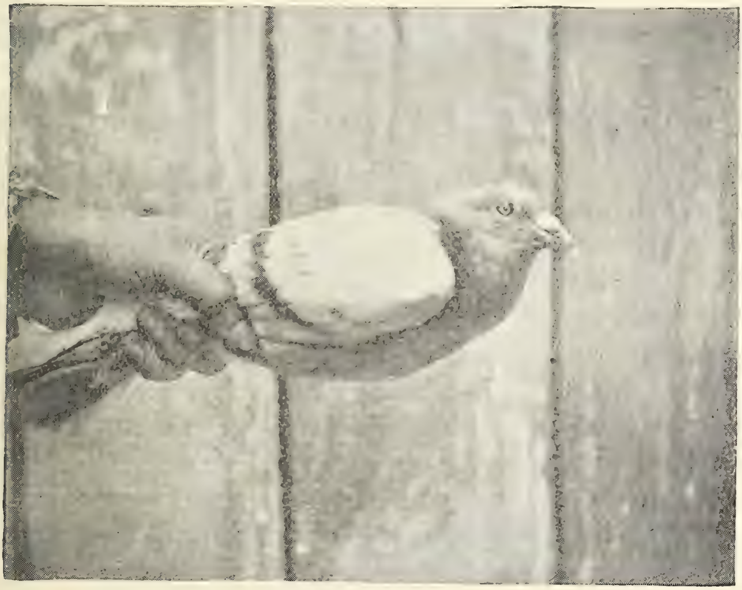
signs of decay are sterility, careless and insufficient feeding of the young, and the rearing of only one bird in a nest. When these things occur two or three times with the same pair of birds, it is time to get rid of them should they be two or three years old or upwards, or to re-mate them if they are young birds. If both cock and hen are mated to different birds, it frequently happens that both are fertile and profitable breeders.

Unmated Birds in the Loft.—The mischief which may be wrought by an unmated bird in the breeding loft is incalculable. If it be a cock, he enters the nests of other birds, and fights with the rightful owners, throwing eggs and young birds on to the floor, where they become chilled, and sometimes driving away a weaker cock and taking possession of his mate. Indeed, one odd cock will upset the tranquillity of a whole loft, and cause more mischief than one would imagine. Odd hens are also a nuisance, for they lay infertile eggs in nests which are not their own, and cause dissention by hatching when and where they are not wanted.

Feeding the Stock Birds.—When pigeons have liberty, as in a state of nature, to fly where they will and choose their own food, they cover a very large area of ground and consume a great variety of food. In the spring they consume grain and seeds which have been newly sown; later on they devour cabbage, lettuce, carrots, gooseberries, and small fruit of all kinds; and in the autumn they turn their attention to the ripe crops of corn and help themselves liberally. With this free life and great variety of food it is not surprising that the birds thrive well and rear many nests of healthy squabs, but the question for the squab-raiser is how he can feed his birds when confined in close quarters so that they will yield equally good results. The answer is: Let him copy nature by feeding a variety of foods. I do not say that he should go so far as to feed small fruit, for it would hardly be economical to do so, but he must not stick persistently to one or two kinds of grain or meal Large, coarse, husky grains must be avoided, because they are injurious to the very young pigeons, and it must be remembered that young pigeons cannot pick for themselves until they are over five weeks old, and that they are consequently dependent upon the parent birds, and the foods which are given to the

old birds must be passed on to the young, whether they are suitable or not, since there is nothing else available.

However, the difficulties of finding a suitable diet are, to a great extent, overcome by the instinct of the parent birds, which teaches them to eat only what is wholesome for the young, and the best system is to keep a variety of seeds and grains in the hoppers, and to feed liberally with mashes, and then trust to the instinct of the old birds to take the foods which are best for their offspring.



A SILVER DUN HOMER COCK.

When newly hatched, and for several days afterwards, young pigeons are nourished on a milky substance or fluid, which is generated in the crops of the parents, and mixed with such foods as may be wholesome. This fluid accumulates during the hatching period, which is sixteen days; and if a pair of squabs, only a day or two old, were given to pigeons which had been hatching only a week, it would be impossible for them to rear the squabs, as they would not have a supply of the necessary fluid to feed them. The pigeon feeds its young by eating a full meal and then disgorging the food into the crops of the young birds.

Unsound and discoloured corn is frequently advertised as food for pigeons, but it is not to be recommended unless the damage is very slight. It pays far better to buy sound grain and meal, and then to avoid waste and keep the birds in good condition. If they are fed on unsound foods they are not likely to keep healthy.

Although many pigeon-breeders do not use mashes, but feed only dry foods, the former has been found satisfactory when there are many young birds in the nests, and it is my experience that a larger number of squabs can be raised to maturity when mashes are provided. A good crumbly mash is much relished, and agrees very well with both old and young birds.

A mash should be given twice a day in long and shallow troughs, and an hour allowed for each meal, so that the old birds can eat enough, feed their young and lay in a second supply before the troughs are cleaned up and laid aside. The mash may be made of equal parts maize-meal, best wheat middlings, barley-meal, and pea-meal, moistened with skim milk. The birds which are rearing very young squabs, eat largely of the mashes and also resort to the hoppers, containing small seeds, such as millet, rape, hemp, &c., but avoid the coarser grains. On the other hand, it may be observed that birds whose squabs are over three weeks old, eat largely of peas, wheat, cracked corn, and similar stuffs. The hoppers should be kept supplied at all times with these various grains, so that the birds can help themselves as they desire.

Amongst other things which it is absolutely necessary to supply with regularity are salt, charcoal, grit, and water. The grit and charcoal should be broken small—say, about the size of wheat—and may be placed in separate boxes or mixed. A box of dry salt or broken rock-salt should be kept where the birds can reach it, for it tends to keep them in health ; and perhaps it is needless to say that fresh water must be regularly supplied. Pigeons also require a bath, and this may be given in a trough or pan about three inches deep. The trough should be filled with cold water every morning after feeding time, as the bath is usually taken early, and it is advisable to throw out the water soon afterwards, so that the pigeons may not drink it.

Rapid Growth of Squabs.—The growth of squabs and the

size which they ultimately attain depend both on the breed and on the feeding, and provided the conditions are favourable they grow with surprising rapidity. If one squab is hatched out a day or two before the other the difference in size can be plainly seen, and the older bird keeps in advance of the younger until they are nearly fledged. When newly hatched it takes about twenty squabs to weigh a pound, but at fourteen days old twenty will weigh ten pounds, and at three weeks old the young birds will weigh a pound and a half per pair. They

PAIR OF SILVER DUN HOMER SQUABS (two weeks old).

continue to grow at this rate until they are four weeks old, when they weigh from two and a quarter to two and a half pounds per pair, and they are then ready for killing. If there is only one squab in the nest the growth is much more rapid, and it ultimately attains a larger size than if there were two.

Breeding Lofts for Pigeons.—Squab-raising does not require a great deal of time and labour when the houses and their fittings are methodically arranged, with a view to saving labour and avoiding the need for constant attention. The most suitable house is a loft divided so as to accommodate about thirty pairs of

breeders in each section, and with proper arrangements for keeping the nests clean and feeding outside. Large undivided houses to accommodate hundreds or thousands of birds are not at all satisfactory, and the best results cannot be attained when too many birds are housed together.

A loft 10 ft. by 8 ft. will amply accommodate thirty pairs of breeding pigeons, and the nests and perches may be conveniently arranged in this way:—Movable shelves, 9 in. wide, are ranged round the walls, one over the other, at distances apart of about 1 ft. These are divided into double nests by sliding partitions, placed at distances of 2 ft. asunder. The shelves are supported by brackets, and along the edge of each shelf a 3 in. wide lath is nailed, to keep the nests in position and keep the eggs and young birds from falling to the floor.

The walls of the rooms are thoroughly lime washed twice a year, and whenever a shelf becomes entirely vacant it is taken out and thoroughly scraped, scoured, and lime washed. While there are eggs or young birds in the nests of course this cannot be done, but as each nest becomes vacant the accumulated dirt is cleared away and that portion of the shelf is dressed with air slacked lime before a new nest is put in.

Pigeons are inclined instinctively to build their own nests, but if a good supply of suitable material is left on the shelves, much valuable time is saved. Coarse straw, cut to 6 in. lengths, makes a nest to take the pigeons' fancy, and they also like to use stems of plants, thin twigs, &c.

Perches of a convenient kind may be made by attaching pieces of broom-handle, about a foot long, to the shelves, and one of these will suffice for each pair of birds. On the floor some material, such as saw-dust or peat moss litter, should be spread, and this should be renewed frequently.

Pigeons must not be fed within the breeding-house for several reasons, the most important of which is that the food would draw rats and mice to the house. Attached to the loft there ought to be a "flier" or enclosure, which can be cheaply made of wire-netting stretched on a light framework. This will be necessary as an exercising and feeding-place for the birds.

Common Causes of Losses.—A certain percentage of losses must be expected, but it is possible to keep the proportion very

low, by strict attention, methodical work, and close observation. The successful squab-raiser must, of all things, be a keen observer. He must be able to detect the quarrelsome birds, as well as those which are sterile, unmated, lazy, poor feeders, and poor breeders, for birds which belong to one or other of these classes have no business in a loft which is run for profit.

Unmated and pugnacious birds are perhaps the greatest source of loss, and the remedy is to keep such birds out of the breeding-lofts. The next enemy is dirt and insect pests. The only remedy is cleanliness: the floors, walls and nests should be kept clean, and the food and water troughs scoured.

Rats work much havoc if they can gain admission to the house, as they have a particular liking for pigeons' eggs and young squabs, and I have known them to destroy as many as thirty nests in a single night. Mice do not eat either the eggs or the birds, but they make their nests under or beside the pigeons' nests, and frighten the birds at night, with the result that the nests are deserted and the eggs and young are lost.

Much loss of eggs and young birds is also caused by unnecessary disturbance, at unnecessary hours, and by the admission of strangers to the lofts. Disturbance should be carefully guarded against, for the pigeon is a timid bird, and easily frightened off its nest. It is well to have regular hours for feeding, cleaning, catching the birds, and for any other work which it is necessary to perform, and on no account should these things be done at night. If the birds are frightened off their nests at night the eggs and young birds are worthless in the morning.

H. DE COURCY.

Agricultural Credit in Belgium.

Agricultural credit has not been so largely resorted to in Belgium as in some other European countries. Here, as in some districts in France, there is a tendency for the small cultivator to regard application to an agricultural bank as a confession of financial weakness, which he therefore endeavours to avoid. At the same time, the number of banks, is, relatively to the size of the country, by no means insignificant

and the growth during the past twelve years has been very great.* Two types exist: (1) the "*comptoirs agricoles*," which were established under the provisions of a law dated 18th April, 1884; and (2) local co-operative credit societies, on the Raiffeisen system of unlimited liability.

The "*comptoirs agricoles*" are few in number, only eight actually existing at the end of 1903, and two of these transacted no business in that year. The remaining six, however, granted 257 loans to the amount of £60,000, and the total loans reached £294,500. The average sum lent was about £200. The operations of these banks, so far as they have gone, have been on a rather larger scale than the Raiffeisen banks, which are chiefly resorted to by the small holders, who in the majority of cases borrow sums under £10.

The money lent by the "*comptoirs*" is obtained from the States Savings Bank, the "*comptoir*" acting as an intermediary between the agriculturist and the Savings Bank. The loans are made on security, but the members of the "*comptoir*" are held personally responsible to the bank for them. The rate of interest is fixed at 4 per cent., of which one-fourth is taken by the "*comptoir*" and the remainder by the Savings Bank.

The Raiffeisen banks, which date only from 1892, now number 359 with 17,600 members. Their growth has been as follows:—

Year.	No. of Societies.	No. of Members.	No. of Loans.	Amount of Loans.
				£
1895	33	1,160	266	4,440
1897	158	5,689	1,371	18,700
1899	229	9,593	2,065	42,100
1901	286	13,308	2,678	76,240
1903	359	17,646	2,978	93,200

A noticeable feature of these banks is that they are very largely used as savings banks, the total deposits in 1903 (including the small capital) amounting to £421,000. In the Belgian official statistics on this subject it is observed that the fact that the deposits are higher than the loans is due to the great confidence inspired by the Raiffeisen banks owing to the unlimited liability of the members, and may be regarded as evidence that the methods

* *Exposé statisque de la situation des associations d'intérêt agricole*, 1904.

of these associations are suited to the customs and needs of the small and medium holders. It may be pointed out, however, that the National Savings Bank allows 3 per cent. on the deposits of credit societies of whatever amount, whereas under ordinary circumstances it only pays 2 per cent. on deposits above £120. It would seem that this concession has been the means of drawing deposits to the societies from persons who do not wish to borrow. The National Savings Bank has given notice of its intention to reduce the interest from 3 to 2 per cent. unless the societies will bind themselves not to receive deposits on any one account exceeding £80.

The possession of these deposits has rendered it unnecessary for the societies to take much advantage of a law dated 21st June, 1894, authorising the States Savings Bank to place part of its funds at their disposal. The object of this law was to group the local banks round central co-operative societies of limited liability, whose special function was to act as intermediary between the affiliated local associations and the National Savings Bank. These central banks, to which the local societies were to be affiliated, would guarantee loans, the amount of which would then be paid direct to the local association by the National Bank. Six of these central banks have been established, with 320 affiliated societies, but the actual business done by them has been very small. Two exist only in name, and the loans from the savings bank in course of repayment at the end of 1903 only amounted to £17,000.

Only one, in fact, of these associations appears to have operations on a large scale, viz., the Central Credit Society of the "*Ligue des Paysans*" ("*Boerenbond*"), established in 1898 at Louvain. This society had 195 local banks associated with it, and, in addition to 63 guaranteed loans with the Savings Bank, it had on its books at the end of 1903, 137 loans made from its own funds, amounting to £34,000. The deposits it received represented a total of £90,000. Members of this society (*i.e.*, the affiliated local banks) must subscribe at least one share, fixed at 100 francs (£4), each share carrying with it a liability for 1,000 francs (£40). The societies must hold one share for every £40 guaranteed in their favour or advanced by the Central Bank. Their accounts are examined and audited annually

by the Central Society, the officers of which can always be consulted by the local officials on any point of difficulty which may arise. These privileges are much prized, and the Belgian Government recognises the value of the inspection of the books by allowing a grant of £1 for each society visited for this purpose.

A new branch of business about to be undertaken by this society is the arranging of loans on mortgage for long terms. An account of this proposal, which was authorised in November, 1903, was given by Dr. Vliebergh, Secretary of the "*Boerenbond*," to the Sixth International Co-operative Congress, 1904, from which it appears that the Central Society intends to raise money by debentures to be lent on mortgage. The method of procedure is for the intending borrower to apply for a loan to his local society, to whom he and his property are known. It values the farm, enquires into the title, and, if it approves, sends the application on, together with the deeds and its valuation, to the Central Bank. If the latter approves, it advances the money on the joint security of the applicant's property and the local society's endorsement. The Central Bank has also power to deal directly with individuals, because there is not a local society in every parish. The rate of interest charged is $3\frac{1}{4}$ per cent. to the local society through whom the money is advanced, who charge the borrowing member $3\frac{3}{4}$ per cent. When a loan is made direct and not through a local society the charge is $3\frac{7}{8}$ per cent.

Soil Inoculation.

Accounts have already appeared in this *Journal** of the recent investigations into the question of soil inoculation for the growth of leguminous crops, which have been made both in Germany and the United States. Experiments are now in progress at most of the agricultural experimental stations in this country for the purpose of testing the efficiency of the material both in the field and in the laboratory, but it cannot be said that the preliminary reports, so far received, are encouraging. In

* "Recent Experiments in Soil Inoculation," *Journal*, Sept., 1904, p. 348; Feb., 1905, p. 669; "Soil Inoculation in the United States," March, 1905, p. 725.

view, however, of the interest which is being taken in the question, and the fact that the preparations are now obtainable commercially in this country, it may be well to point out that it is only under certain conditions that the use of cultures is claimed to offer any possibility of gain.

These conditions, which have been referred to in the previous articles, are summarised * by the United States Department of Agriculture as follows :—

When Inoculation is Necessary.—Inoculation is necessary—

1. On a soil low in organic matter that has not previously borne leguminous crops.

2. If the legumes previously grown on the same land were devoid of nodules, or "nitrogen knots," thus showing the need for the nodule-forming bacteria.

3. When the legume to be sown belongs to a species not closely related to one previously grown on the same soil. For instance, soil in which red clover forms nodules will often fail to produce nodules on lucerne when sown with the latter crop for the first time.

When Inoculation May Prove Advantageous.—Inoculation may prove advantageous—

1. When the soil produces a sickly growth of legumes, even though their roots show some nodules.

If the cultures introduced are of the highest virility, their use will often result in a more vigorous growth.

2. When a leguminous crop already sown has made a stand, but shows signs of failing, owing to the absence of root nodules.

The use of the culture liquid as a spray or by mixture with soil and top-dressing may save the stand if other conditions are favourable.

When Inoculation is Unnecessary.—On the other hand, inoculation is unnecessary and offers little prospect of gain—

1. Where the leguminous crops usually grown are producing up to the average, and the roots show nodules in normal abundance.

Cultures of nitrogen-fixing bacteria are not to be regarded in

* United States Department of Agriculture, Bureau of Plant Industry, Bulletin 72. Part IV.: Inoculation of Soils with Nitrogen—Fixing Bacteria.

the light of fertilisers, or as capable of increasing the yield under average conditions. They do not contain nitrogen itself, but bacteria, which make it possible for the legumes to secure nitrogen from the air (through the formation of root nodules). Where the soil is already adequately supplied with these bacteria, it will not usually pay to practice artificial inoculation.

2. When the soil is already rich in nitrogen.

It is neither necessary nor profitable to inoculate a soil rich in nitrogen when sowing legumes. Not only does the available nitrogen in the soil render the formation of nodules less necessary, but the nitrogenous materials in the soil largely prevent the bacteria from forming nodules.

Any increased virility in nitrogen-fixing power possessed by any of the types of bacteria yet distributed may be rapidly lost in a soil containing an abundance of nitrogen, because the bacteria are in a medium in which there is no demand for activity in securing atmospheric nitrogen.

When Failure is to be Expected.—Inoculation will fail where other conditions (aside from the need of bacteria) are not taken into account, among which are the following—

1. In soil that is acid and in need of lime.

Liming to correct acidity is as important for the proper activity of the bacteria as for the growth of the plants.

2. In soil that is deficient in fertilisers, such as potash, phosphoric acid, or lime.

The activity of the bacteria in securing nitrogen from the air and rendering it available to the legumes does not do away with the need for such fertilising elements as potash and phosphorus.

3. It must also be remembered that inoculation does not "act like magic"; it will not overcome results due to bad seed, improper preparation and cultivation of ground, and decidedly adverse conditions of weather or climate.

In the use of the cultures, also, failure is almost certain where the directions are not carefully studied and intelligently followed.

The Local Government Board have furnished the Board of Agriculture with the following summary of the law relating to the rating of sporting and fishing rights :—

Rating Sporting and Fishing Rights.*

Under the old statute (43 Elizabeth, c. 2) the sporting right was in no case separately rated, although, where the occupier of land retained the right of sporting or let it to another person, the value of the right formed an element in estimating the value of the land to the occupier (Reg. *v. Battle*, L.R. 2, Q.B. 8).

Where the right is not severed from the occupation of the land (*i.e.*, where the owner retains both the land and the right, or lets them both to one tenant) the value of the sporting rights are still included in the valuation of the land ; but in any other case, the right must be dealt with in the manner directed by Section 6 of the Rating Act, 1874.

Sub-section (1) of that section provides that where any right of sporting is severed from the occupation of the land, and is not let, and the owner of such right receives rent for the land, the right shall not be separately valued or rated, but the gross and rateable value of the land shall be estimated as if the right were not severed. It would seem, however, that the prohibition in the sub-section of a separate valuation or rating of the right of sporting is modified by Section 5 (a) of the Agricultural Rates Act, 1896, which requires that in every valuation list the value of agricultural land shall be stated separately from that of any building or other hereditament. Where, therefore, the rateable value of any agricultural land is, under the Rating Act, 1874, increased by reason of its being estimated as if the rights of sporting were not severed, the amount of such increase should, for the purpose of the valuation list, now be included in the rateable value of buildings and other hereditaments not being agricultural land.

The rate payable in respect of any sporting right so entered in the valuation list may be deducted by the occupier of the land from his rent under Section 6 (1) of the Act of 1874, unless he has specifically contracted to pay such rate in the event of an

* This summary, together with a *résumé* of the Memorandum on the Rating of Woodlands, which appeared in this *Journal* in June last, will be included in Leaflet No. 8 (Assessments to Local Rates), which will shortly be revised.

increase. The direction in Section 6 (1) is that the value of the land shall be estimated *as if the right were not severed.* It would appear, therefore, that in dealing with the right as an element of value, it ought not to be estimated upon any such consideration as that of the rent which a third person might be found to give for it, but according to its worth, if any, to the occupier of the land, upon the supposition that the right is not severed : or, in other words, that he himself is entitled to exercise the right, without the power of making a profit by letting it.

The effect, therefore, of this provision is to place those lands which are let by an owner, with a reservation of the right of sporting, on the same footing in relation to rateability as the lands which he himself occupies, retaining the right to the game upon them.

The preceding remarks are mainly directed to those cases where the right of sporting is severed from the occupation of the land, but is retained by the owner. Where, however, the right is let to a person other than the occupier of the land, it is rateable as a separate hereditament, and either the owner or the lessee of the right may be rated, as the occupier of the right of sporting, under Section 6 (2) of the Act of 1874. The ordinary rules of law for determining the gross estimated rental and rateable value of other kinds of property will apply.

Subject to the provisions of Section 6 the owner of any right of sporting, when severed from the occupation of the land, may be rated as the occupier of the right, under Sub-section (3) of the section. But where the owner receives rent for the land he could not be rated under Sub-section (3) as the occupier of the right, because this case is dealt with by Sub-section (1) of the section. For the purposes of the section the owner of the right is (1) the person entitled to exercise the right, if the right is not let ; (2) if let, the person who is entitled to receive the rent for the same. The Poor Rate, General District Rate, Special Sanitary Rate, and other local rates are payable in full upon sporting rights when severed from the occupation of the land over which they are exercised and separately assessed.

The observations relative to the right of sporting are equally applicable to the assessment of the right of fishing.

Notes on Foreign Crop Prospects.

France.—According to the official report of the Ministry of Agriculture, published on the 14th July, 3,647,000 acres have been planted with potatoes, of which the condition of rather more than 1,954,000 acres is returned as "good," of 1,433,000 acres as "fairly good," and 259,000 acres as "passable."

The official report of the Ministry published on the 2nd August gives the condition of winter wheat as "good" in forty-three Departments, "fairly good" in thirty-eight, and "passable" in four. In the case of spring wheat only nineteen Departments are classed as "good," twenty-eight being "fairly good," and three "passable."

The British Consul-General at Havre, in a despatch to the Foreign Office dated July 18th last, observes with regard to the fruit crops in Normandy that early plums, called "Cherry plums," are plentiful, but the varieties which will follow, such as Gallon and Orleans, are very scarce. Greengages will render half a crop. Garden pears, such as Williams and Duchess, and all the later table pears, including winter pears, will be very scarce, whereas stewing pears will be more plentiful. Walnuts and nuts will be plentiful. Cider and table apples will be very scarce, the crop of the former about equalling one-third of an average crop. The official report puts the condition of pears and apples for cider as "good" in four Departments, "fairly good" in ten, "passable" in seven, "indifferent" in nineteen, and "bad" in five Departments.

Germany.—The condition of crops in Germany in the middle of July is indicated numerically as follows (2 = good; 3 = average):—Winter wheat, 2·4; spring wheat, 2·5; winter rye, 2·5; spring rye, 2·6; barley, 2·5; oats, 2·8; and potatoes, 2·3. The condition of the winter cereals, which in many districts have been unfavourably affected by the prevailing drought, remains generally satisfactory. In many parts of North Germany it have been improved by rain. The spring cereals have suffered more from the heat and drought. Only in a few districts has the rain benefited them, and where it has been insufficient or too late, they are short in the straw, thin, and affected by weeds and rust.

In many of the districts visited by the long drought, the potato crop has been attacked by "blackleg" and "leaf-curl," and its growth has been at a standstill. In general, however, the rain which has fallen has enabled it to recover from the drought, and it appears, except in Bavaria, to be nearly everywhere in a good and healthy condition.

Hungary.—According to the official report of the Hungarian Minister of Agriculture harvest work is in a very advanced state; not only is the reaping of rye and wheat finished in many places, but this is also the case with barley, and here and there with oats. The wheat crop is estimated at 152,800,000 bushels (of 60 lb.) compared with 137 million bushels last year and 162 million bushels in 1903. The barley harvest is put at 56,200,000 bushels compared with 47,900,000 bushels in 1904, and the yield of oats at 65 millions against 51½ million bushels.

Russia.—According to an official report, communicated by the British Commercial Agent in Russia, the condition of crops in European Russia up to the middle of July was as follows:—Winter wheat, above the average; rye, below the average; spring wheat, an average crop; oats, above the average.

So far as unsatisfactory harvest prospects are concerned, the Governments of Saratoff and Voronejare are mentioned as unsatisfactory or bad for all crops; Riazan and Tamboff as unsatisfactory or bad for winter and spring wheat, rye, and oats; Tula and Tavride for winter wheat, rye, oats, and barley; Samara for rye, spring wheat, and barley; Simbirsk for rye and spring wheat; and Penza and the Don Territory for winter wheat and rye.

The Consul-General for Warsaw reports that at the middle of July the condition of both winter and spring wheat, rye, oats, and barley was good throughout Poland and Lithuania.

United States.—Preliminary returns to the Department of Agriculture show the acreage of maize planted to be about 94,011,000 acres, an increase of about 2,080,000 acres on the area planted last year. A telegraphic summary in the *Times* of the official returns states that the average condition of the growing crop on August 1st was 89·0 as compared with 87·3 on the same date in 1904. The average yield of winter wheat

is put at 14·3 bushels per acre compared with 12·4 bushels last year, indicating a total production of 424,400,000 bushels against 332,935 bushels in 1904. The average condition of spring wheat was 89.2 compared with 87.5 in August of the previous year. The oat and barley crop are put at 90·8 and 89·5 respectively.

Roumania.—According to official reports quoted by *Dornbusch*, the yield of wheat is highly satisfactory as to quantity, but the quality varies a good deal, so that the average is considered to be rather inferior to that of last year.

Canada.—According to a report in the *Times*, the official estimate of the area under wheat in Manitoba is 2,644,000 acres, and in the North West Territories 1,121,000 acres. Last year the areas were 2,412,000 and 966,000 acres respectively. The yield of spring wheat in the Territories is officially estimated at 21,723,000 bushels compared with 16,723,000 bushels in 1904.

Effect of Blue-stone and Formalin on Germination.

Reference is made in the Board's Leaflet No. 92, on the prevention of bunt and smut, to the fact that barley and oats suffer somewhat seriously in germination when treated with blue-stone. Experiments on this point, which have been carried out by the University of Leeds at the Garforth Experimental Farm (Bulletin No. 49) show this to be the case when the solution is used at its full strength.

In the first experiment, conducted in 1902, one plot was sown with untreated seed (barley), and a second plot with the same quantity of seed which had been dressed with a solution of blue-stone in the following proportions:—1 lb. of blue-stone in 1 gallon of water to 1 sack (4 bushels) of seed.

It was noted that the plants from the pickled seed were slower in coming through the ground, and that in the initial stages of growth they had a rather sickly, yellowish appearance. In a short time they recovered, and the pickling had the effect of entirely preventing smut, with the result that the sample from the pickled plot was decidedly the better from the

maltster's point of view. The test was repeated in 1903 with similar results. As it seemed possible, however, that a smaller quantity of blue-stone might be less injurious to the plant in its early stages, it was decided in 1904 to determine the effect of reducing the proportion of blue-stone.

Treatment.	Yield per Acre.				Natural Weight per Bushel. lb.
	Saleable Bushels. 56 lb.	Seconds Bushels. 56 lb.	Total Bushels. 56 lb.	Straw. cwt.	
Not dressed... ...	32¾	8¼	41	21	55
Dressed with ½ lb. blue-stone ...	32½	5¾	38¼	26¼	54
Dressed with 1 lb. blue-stone... ...	27¼	6	33¼	24	55

The results indicate that blue-stone does, to some extent, detrimentally affect the yield. If the yield of saleable corn alone is considered no ill effect has resulted from the use of the reduced quantity of blue-stone. If total yield of grain is considered, then even the smaller quantity of blue-stone would seem to have injuriously affected the crop. It is hardly to be expected, however, that the chemical will not have some injurious influence on the young plant, but the loss occasioned thereby will be small compared with that caused by an outbreak of the disease.

The increased weight of straw on both the pickled plots would, at any rate, tend to show that the plant had not been permanently injured, but that possibly the pickling resulted in a slight thinning of the crop in the initial stages.

There was very little smut in 1904 on the plot sown with unpickled seed, so that it remains to be seen whether the weaker solution is strong enough to prevent the disease.

The above experiments were carried out with barley. Two experiments have recently been reported as to the effect both of blue-stone and formalin on germination in the case of wheat. In the *Agricultural Gazette of New South Wales*,* Mr. R. W. Peacock, of the Experimental Farm, Bathurst, states that it was shown by experiment that the blue-stone method may kill

* March, 1905.

a considerable proportion of the grain sown. He points out that solutions of blue-stone may be used much stronger without serious injury when the ground is well-nigh saturated with moisture than when it contains only a limited amount; it would therefore be possible to use a solution of a given strength without injury to the grain in a moist season, whereas the same strength would kill over half the grain if sown in a comparatively dry seed bed. The method adopted in the experiments was to infect all the grain with bunt, and to immerse it for five minutes in solutions of various strength, viz., 1 lb. of blue-stone in two to eight gallons of water. When sown under rather dry conditions the highest percentage of plants which grew was 58, and the lowest 23 per cent., whereas the untreated grains averaged 86 per cent.

Solutions of formalin were also tested, and at a strength of 1 lb. of formalin to forty gallons of water, 71 per cent. of the plants matured.

Mr. McAlpine, Vegetable Pathologist to the Victorian Department of Agriculture, has also been testing the effect of formalin on seed wheat.*

The object of the experiment was to find out the most suitable strength of formalin, consistent with the proper germination of the grain. For this purpose a solution was used at the rate of 1 lb. of formalin in 40 gallons of water, gradually increasing this to 1½, 2, 2½, and 3 lb. respectively in the same amount of water. The wheat used was Rerraf, and six lots of 1,000 grains each were carefully counted out; one of the lots not being treated was used as a check. Each of the other five lots was steeped for fifteen minutes in its respective strength of solution, then allowed to dry, and placed in moist flannel for germination. Steeping for ten minutes is recommended when treating seed wheat on a large scale, but it was considered that with such a small quantity of grain the drying would take place so quickly that, in order to counterbalance this, the time allowed in contact with the formalin should be longer. The check lot was placed in water only for the same period of time, then allowed to dry, and germinated like the others. The results are given in the table below.

* *Agricultural Journal of Victoria*, May, 1905.

The effect of treatment with formalin on the germination of the seed was practically the same after nine days for strengths of 1, 1½, and 2 lb. in 40 gallons of water, with a slight check on the germination at first with strengths of 1½ and 2 lb. Above 2 lb. germination was much slower, but it was only 3 lb. that really gave a low percentage of germination at the end of nine days, and this was partly due to mould, which appeared on the grains germinating so slowly.

GERMINATION TEST OF SEED WHEAT TREATED WITH FORMALIN.

Dip.	Number Germinated per 1,000 in—				
	2 Days.	3 Days.	5 Days.	6 Days.	9 Days.
Check	830	917	944	946	969
1 lb. formalin in 40 gals. water...	827	908	940	948	964
1½ lb. ,, ,, ...	798	893	930	944	963
2 lb. ,, ,, ...	714	860	936	948	960
2½ lb. ,, ,, ...	514	717	915	932	—
3 lb. ,, ,, ...	480	638	749	771	786

As far as this experiment goes, it shows that Schering's formalin, at a strength of 1 lb. in 40 gallons of water (= ·1 per cent. formaldehyde), exercises no injurious influence upon the grain, and that germination is at least equal to that of untreated grain. During the coming season, lots of 1,000 grains of wheat, treated as above, will be sown in the field, and the results of germination compared.

The strength of the solution recommended in the Board's Leaflet (No. 92) is 1 pint of 40 per cent. formalin to 36 gallons of water, *i.e.*, ·14 per cent. of formaldehyde.

Another experiment dealing with the strength at which it is desirable to use formalin is mentioned by Professor Windisch in the *Wiener Landwirtschaftliche Zeitung* (24th Dec. 1904). He states that solutions were used containing formaldehyde in the proportion of ·02, ·04, ·08, ·12, ·2, and ·4 per cent. It was found that when wheat was steeped in them for 24 hours the weakest of these exercised an injurious influence on the germinating power. The ·08 per cent. solution delayed germination about 24 hours, but within 14 days 88·5 per cent. of the seed sprouted, compared with 98 per cent. when

untreated. With the ·12 per cent. solution only 9·25 per cent. germinated in 14 days, and with the stronger solutions no germination took place. It will be noted, however, that the grain was steeped in them for much longer than is recommended in farming practice. Similar experiments reported in the same publication were carried out by Dr. Von Sibrik with half a pint of 40 per cent. formalin in 100 pints of water (*i.e.*, ·2 per cent. solution). Wheat steeped in this for 5, 10, and 15 minutes germinated 85, 82, and 87 per cent., whereas a solution three times as strong (*i.e.*, ·6 per cent.) seriously lowered the germination. He recommends therefore the use of a ·2 per cent. solution in which the grain should be steeped for 15 minutes.

The above experiments relate to the effect of these substances on the germination, but it may be of interest to add the results of some trials of different methods of preventing bunt or smut in wheat, made at the Holmes Chapel Agricultural School in 1902:—

Dressing Applied.		Percentage of ear affected with Bunt.	Quality of Sample of Grain.
Materials Used.	Method of Using.		
1. None	—	20	Bad.
2. Copper Sulphate, 1 lb., Water, 1 gallon	Steeped for 15 min.	0	Good, Plump.
3. Copper Sulphate, 1 lb., Quicklime, 1 lb., Water, 1 gallon	,, ,, 4 hours		Fair.
4. Urine and Quicklime	Steeped in Urine, 1 hour, and dried with Quicklime	0	Poor, Shrivelled.
5. Water	Steeped for 2 min. in water at 113° F., and 15 min. at 132° F.	0	Fair.
6. Formalin, ½ oz. of 40 per cent. sol., 1 gallon Water	Steeped for 1 hour	5	Poor.
7. Crude Carbolic Acid, 1 lb., Water, 1 gallon	do.	10	Poor, Shrivelled.
8. Caustic Soda, ½ oz., Water, 1 gallon	Steeped for 6 hours	16	Bad, Shrivelled.

The dressing with copper sulphate proved to be the most satisfactory method. In these trials the strength of the formalin solution was ·125 per cent. of formaldehyde, in which the wheat was steeped for one hour.

Diseased "Evergood" Potatoes.

During the past two years diseased examples of the potato known as "Evergood" have on several occasions been submitted to the Board of Agriculture and to Kew for investigation.

The disease presents very characteristic and easily recognised features, and so far as at present known is confined to the one variety of potato mentioned above.

"Measly" is the name used by one grower in describing the appearance of the disease, and the term is certainly expressive, the surface of the tuber being studded with small brownish warts; each wart is surrounded by a very slight depression as shown in the accompanying illustration. If a wart is cut through, its substance is found to be much firmer than that of the surrounding healthy tissues, and of a brownish-green colour. The diseased tissue does not penetrate very far into the flesh of the tuber, and is entirely removed with a somewhat thick "paring," hence the disease does not occasion much loss of substance, but on the other hand the unsightly warted surface very much depreciates the market value.

When a thin section through a wart is examined under the microscope the mycelium of a fungus is often to be seen in considerable quantity; this suggested the idea that the fungus was the primary cause of the disease. Following this idea an attempt was made to obtain pure cultures of the fungus present, and determine its nature. After experimenting for a year along these lines, it became obvious that the primary cause of the disease was not of a fungal nature, notwithstanding the almost constant presence of the fungus in the tissues forming the warts.

The culture experiments clearly proved that no one particular species of fungus was constantly present in the warts, but in some instances three distinct kinds of fungi were obtained from different warts formed on the same tuber, in other instances two different fungi were present in the same wart. Among the various fungi isolated from the warts were species of *Fusarium*, *Verticillium*, *Spicaria*, *Macrosporium*, a very interesting minute species of *Oedomyces*, apparently previously unknown, also *Rhizoctonia* in abundance. Notwithstanding the presence of an ample supply

of each of the above-named fungi, every attempt—amounting to some hundreds in all—to produce the disease artificially by infection, completely failed, thus proving that the fungi present were only secondary factors in relation to the disease, and that the true cause must be searched for along other lines.

Plots in the Jodrell Laboratory garden at Kew were planted with potatoes received from Scotland, Yorkshire, and Kent respectively. Other potatoes from each source were planted in plots which, along with the soil and manure used, were sterilised by steam.

The young tubers were first examined when about the size

DISEASED "EVERGOOD" POTATO.

of a marble, and the true cause of the disease was at once revealed.

The skin or periderm of a potato tuber is provided with a large number of breathing pores or lenticels, which in all varieties of potato examined, other than "Evergood," are barely visible to the naked eye. In the last-named variety, however, the lenticels are very conspicuous, and project considerably beyond the general surface of the tuber, so much so that when a young tuber that has been carefully dug up is held between the eye and the light, the surface presents a minutely velvety appearance. This appearance is due to the presence of little groups of dead cells that are constantly being pushed outwards by the long continued division and growth of the living cells

belonging to the lenticels behind, hence the surface of the tuber is covered with little groups of dead cells.

The mycelium of fungi that happens to be in the soil surrounding a tuber thus formed, finds suitable food in the dying or dead superficial cells. When the fungus penetrates sufficiently to reach the deeper living cells, the irritation set up by its presence causes the living cells of the tuber to divide quickly and form a wall of cells specially constructed to check the progress of the fungus into the interior of the potato. By this means the warts are built up by the tuber in its endeavour to arrest deeper penetration by the fungus.

Young tubers were carefully exposed without disturbing their continuity with the parent plant, and infected with cultures of the fungi mentioned above, and in course of time the warts formed on these tubers contained the same kind of fungus as that used for infection.

The check potatoes grown in sterilised soil remained free from warts.

The above experiments prove that the primary cause of the disease of "Evergood" potatoes is due to the excessive development of the lenticels in this particular variety. The dead cells situated over each lenticel favour the attacks of various kinds of fungi present in all soils, which could not gain an entrance into the tuber through the unbroken surface of the skin or periderm.

A further scientific account of these experiments will be given elsewhere at a later date.

Blackleg in Potatoes.

The attention of the Board was recently called to a disease occurring among potatoes in Cheshire, and reported to be very destructive. A specimen, accompanied by the haulm, was forwarded to the Royal Botanic Gardens, Kew, and proved to be a typical example of the "blackleg," or potato stem rot, described in Leaflet No. 117.

The leading symptoms of the disease are as follows:—The leaves wilt and turn yellow; then they become shrivelled from below upwards, and finally die. If the underground portion of

the stem is examined when the leaves commence to droop its surface will be found to be more or less covered with brownish stains. This discolouration gradually extends up the stem, which finally becomes black and rotten throughout. The number of plants affected in a potato field varies very widely. Diseased plants may be found growing among perfectly healthy ones, but more frequently the disease spreads from one plant to another.

The disease is primarily caused by a bacterium called *Bacillus phytophthorus*, but as decay proceeds various kinds of fungi, *e.g.*, moulds, &c., assist in the completion of the work. In some samples of last year's crop (Scottish Triumph) forwarded from Cheshire, which were badly diseased, *Fusarium* and other fungi were present—apparently the outcome of neglect before storing. The disease spreads with greatest rapidity during hot, damp weather, and is most abundant during the months of June and July. The death of the haulms at this early period of the season, especially in the case of late varieties, means serious loss, not only on account of the scanty crop, but because the tubers also become infected by the bacteria that have been washed into the soil from the rotten haulms.

Direct infection of the land is caused in this way and by allowing diseased tubers to rot on the land where they grew.

Indirect infection results when diseased haulms and tubers are placed on the manure heap, or are thrown into the pigstye. In this case the quantity of bacteria returned to the land along with the manure is far greater than in the case of direct infection.

To prevent infection in any form, all diseased plants should be collected and burned as quickly as possible. The time and labour involved in the collection of the rotten potatoes and the haulm will be well repaid.

The following measures have been suggested by Dr. Otto Appel, who has studied the disease in Germany :—

(1.) Potatoes, as well as beans, carrots, turnips, cucumbers, vegetable marrows, sugar-beet, and mangolds, which are also susceptible to the disease, should not be cultivated for two years on land where the disease has occurred. (It has been experimentally proved that cereals are not susceptible.)

(2.) Potato "sets" should not be cut, but the tubers should be planted entire.

(3). Care should be taken to obtain seed from districts where the disease does not exist.

(4.) Lime, or strong nitrogenous manures, especially nitrate of soda and sulphate of ammonia, should not be used.

Experiments in the Prevention of the Cabbage Flea.

Several experiments have recently been carried out on a large scale in Germany, by Dr. Kleberger, of Giessen, for the purpose of testing the measures usually recommended for the prevention of the Cabbage Flea (*Haltica oleracea*),* which, in consequence of the dry weather, has been very destructive in Germany this year.

The remedies which were tested, were (1) the application of artificial manures, such as quicklime, kainit, nitrate of soda, sulphate of ammonia, and super-phosphate, which, in consequence of their corrosive action, tend to keep the insect at a distance; (2) substances, such as sawdust, peat litter, and fine soot, which make it difficult for the fleas to move about, and so prevent their spreading; (3) a combination, suggested by Dr. Sorauer, of (1) and (2), in which sawdust and peat litter are moistened with a 40 per cent. solution of quicklime or of kainit, or of nitrate of soda and sulphate of ammonia, and then applied so that the hindrance to movement is combined with the caustic effect of the manure; and (4) tobacco dust and horse manure, finely powdered, as well as the use of Paris green for spraying the leaves.

The experiments were carried out at four centres, on plots each of 600 square yards. The quantity of artificial manure applied amounted to 50 lb. per plot, or about $3\frac{1}{2}$ cwt. per acre. It was distributed along the rows, as near as possible to the plants. The sawdust, peat, soot, and horse dung were spread equally over the whole area. The tobacco dust was in one case put on with a large brush when the dew was on the plants, and in another case sprayed on in a moist state. The Paris green was sprayed on as a 5 per cent. solution.

* This insect is dealt with in Leaflet No. 3, "Flea" Beetles.

A difficulty was met with in the distribution of the sawdust and similar materials. In perfectly calm weather it was found practicable to spread the sawdust and peat litter equally over the ground, but even under these conditions the equal distribution of soot and powdered horse dung was hardly possible. In windy weather it was out of the question.

In the Sorauer method (No. 3 above) sawdust and peat litter were moistened separately with a 40 per cent. solution of various artificial manures, 1 cwt. of peat being sprinkled with 35 pints of solution, and 1 cwt. of sawdust with $8\frac{3}{4}$ pints. The materials were thoroughly mixed, left in a heap to dry for twenty-four hours and then spread on the ground.

The distribution of the tobacco dust in a dry form was found preferable to its application in a moist state.

The results of the experiment were as follows:—Quicklime, kainit, and also sulphate of ammonia were successful in all cases in preventing the spread of the "flea" beetle, but they injured the condition of the plants, the plots of cabbage which were treated showing after three days many yellow plants, the growth of which was completely at a standstill for a long time. The application, however, of nitrate of soda and super-phosphate had no injurious effect on the plants, while the propagation of the pest was successfully checked. These two manures applied in the proportions mentioned above are therefore to be preferred to others for this purpose.

Sawdust, peat litter, and soot did not prove able to restrain the attack, but the sawdust and peat litter had a better effect when impregnated with one of the fertilisers. Peat litter moistened with a solution of quicklime in water proved most advantageous. A strip, about 12 ft. wide, round a large field of rape, of which one side was attacked by the "flea," was able in this way to protect the field from further injury.

A protective strip treated with powdered horse manure did not prove so successful. It proved excellent at first, but failed after frequent rain.

The application of tobacco dust and Paris green caused the beetles to disappear almost immediately.

For practical purposes the employment of artificial manures cannot be recommended on account of the expense, but as a

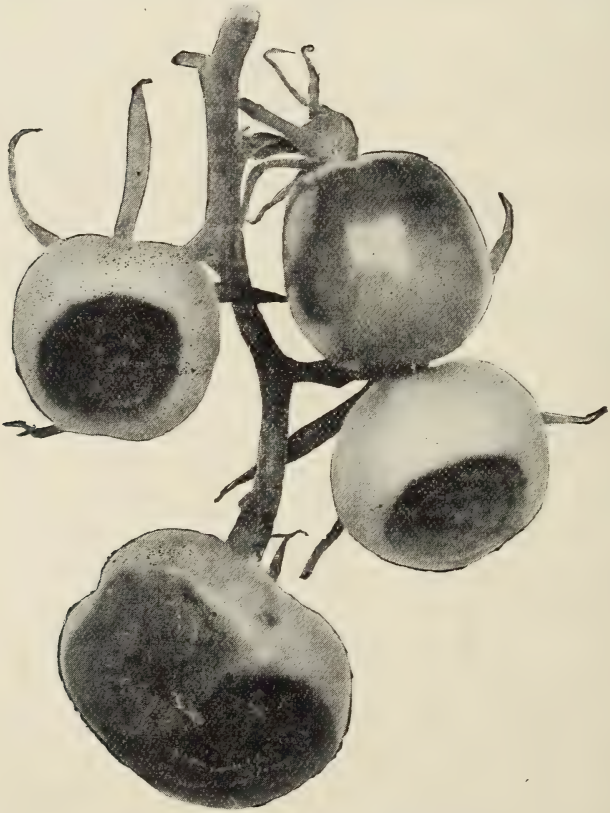
protective measure against the invasion of the beetles from adjacent breeding grounds, the treatment of strips not less than 12 ft. wide with peat litter and lime water, or with fresh horse dung, is worth considering.

Dusting the plants in the dew with tobacco dust is an excellent method, and this should not be expensive.

[*Deutsche Landwirtschaftliche Presse*, July 1st, 1905.]

Bacterial Disease of Tomatoes.

This disease has long been known in France, where, during certain seasons, it has assumed the proportions of a destructive epidemic. A single example was received at Kew some years ago for identification, since which time until the present season its occurrence in this country has not been noted. Quite recently, however, examples of the disease have



BACTERIAL DISEASE OF TOMATOES.

been received from three widely separated localities, which suggests that it has invaded this country in earnest.

The symptoms are very marked and cannot be confounded with those of any other tomato disease at present known. When the tomato is about the size of a marble a minute blackish patch first appears at the base of the style. This patch gradually increases in size, retaining a circular outline, until eventually the entire fruit is reduced to a blackish, soft decayed mass.

Experiments have shown that infection takes place during the flowering stage, and that the bacteria causing the disease are deposited on the stigma by flies visiting the flowers.

The stigma appears to be the only vulnerable part under ordinary conditions; nevertheless, if bacteria from a diseased fruit are introduced into the flesh of a healthy tomato at any point of its surface by means of the point of a very fine needle, infection follows.

This disease does not appear to be influenced to any extent by the forcing method of cultivation commonly followed, as it has been observed in a house where the temperature was kept comparatively low.

When the disease appears all diseased fruit should be removed as quickly as possible, and not allowed to decay and liberate the bacteria present in the tissues. Insects should also be excluded by using an insecticide. This last act would necessitate artificial pollination with a camel-hair brush.

Importation of Live Stock.—France.*

The French Ministry of Agriculture have issued a Decree, dated June 11th, 1905, dealing with the importation and transit of animals.

It provides that the importation and transit of horses, asses, cattle, sheep, goats and pigs is only to take place through certain specified Customs-houses.

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* Live stock import regulations have been published in this *Journal* for the following countries:—Transvaal, March, 1903; United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; and South Australia, July, 1905.

The stock must be accompanied by a certificate of origin from the administrative authority of the place from which they come, certifying that no contagious disease affecting animals of the species in question exists or has existed in that place during the preceding six weeks. The certificate is to state the number and description of the animals. It should not have been issued more than three days before the despatch of the animals. Animals not accompanied by such a certificate, or which are not presented with as little delay as possible after the expiration of the voyage, are to be rejected.

At those Customs-houses which are open for importation, but which are not sufficiently important to justify the expense of a local veterinary service, a certificate of health is to be substituted for the veterinary inspection. This certificate may be issued by a foreign veterinary surgeon, whose signature must be attested by the authority of the place of origin, or by a French veterinary surgeon, whose signature must similarly be authenticated. These certificates are only valid for three days, and are to be handed to the Customs-house officers.

Animals arriving by sea will be submitted to a preliminary examination on board ship, where they should be penned by lots in such a way that it is possible to move freely between them. Permission to land the animals will be refused if this is not done.

Foreign cattle presented for importation are to be submitted to the tuberculin test, and for this purpose are to be kept under observation, at the expense of the importers, for forty-eight hours at least. Those which show reactions characteristic of tuberculosis are, when arriving by sea, to be slaughtered in the abattoir under the supervision of the veterinary inspector. The importation of foreign cattle, which have to be submitted to the tuberculin test, can only take place at certain specified places, among which may be mentioned, Dunkirk, Calais, Boulogne, Havre, Dieppe, Honfleur, Granville, Cherbourg, St. Malo, Brest, Rochelle, Bordeaux, and Marseilles.

Calves under one year old and cattle declared for slaughter are exempt from the tuberculin test. Animals for slaughter are only admitted for consignment to markets of districts where a public abattoir exists.

The charges for veterinary inspection at those places where a veterinary service exists are to be as follows:—Horses, asses, and mules, per head, 10d. (1 franc); sheep, lambs, and goats, 1d. per head; pigs and sucking pigs, 1d. per head. Cattle intended for slaughter and so marked: bulls, bullocks, cows, $7\frac{1}{2}$d. per head; young bulls and bullocks, heifers and calves, 5d. per head. Cattle tested with tuberculin, and horses and asses tested with mallein, $1\frac{1}{2}$ francs per head.

Animals arriving by sea and found to be affected with pleuro-pneumonia, sheep-pox, or foot-and-mouth disease, together with those exposed to infection, are to be killed under the supervision of the veterinary inspector.

In the case of foot-and-mouth-disease among breeding animals, authority may be given for them to be quarantined.

Animals attacked with glanders and farcy are to be slaughtered; while those in contact, and those presenting suspicious symptoms of glanders are to be tested with mallein.

Animals affected with anthrax or with quarter-ill or blackleg (*fièvre charbonneuse ou charbon symptomatique*) are to be destroyed, and those in contact are sent to the butcher.

Sheep affected with sheep-scab are to be slaughtered immediately in the abattoir under the supervision of the veterinary inspector, but in the case of breeding stock, quarantine may be authorised.

In the case of pigs, animals affected with swine erysipelas or swine fever (*rouget* or *pneumo-entérite infectieuse*) are to be immediately slaughtered, together with those in contact.

Vegetable Matter in Wool.

Complaints have recently been made to the Bradford Chamber of Commerce by spinners and manufacturers with regard to the increasing amount of vegetable matter (grass, straw, hemp, &c.) which appears in British wools, and the serious damage resulting therefrom. The Bradford Chamber have accordingly issued a circular letter to British Chambers of Agriculture and to wool-growers drawing attention to the matter, with a view to some remedial action being taken.

It is recognised that these extraneous matters only get into the wool through inadvertence; for instance, through shearing

the sheep and winding the fleeces in places where particles of grass straw, &c., are littered about, and tying up the fleeces with loose twisted string known as "binder twine."

The faults (which are not so pronounced in wools competing with home-grown ones) may appear trivial to wool-growers, but they are very serious matters indeed to the consumers of the wool. Vegetable fibres absolutely refuse to take the dyes used for animal fibres; consequently these vegetable fibres are plainly visible in the finished article and seriously depreciate its value. Even when efforts are made to remove them before the wool is combed, such efforts are not wholly successful, for even with the utmost diligence it is impossible to detect small particles, and these consequently become incorporated in the wool and are not visible until the goods are dyed and finished. Dress goods and cloths are often damaged in this way to a considerable extent.

The Chamber desire to point out the importance of these matters, and wish the attention of wool-growers to be drawn to the necessity of seeing that no grass, straw, &c., is wound with the fleeces, and that the use of "binder twine" is discontinued. Such twine is mostly used in a few southern counties for tying fleeces, but it is quite unnecessary.

This matter is dealt with in Leaflet No. 82, and the following suggestions made therein as to the method of tying fleeces may be reproduced here:—

The fleeces should be rolled on a clean wooden table, and should be tied up with bands made by twisting a portion of the fleece itself. It is not necessary for these bands to be tightly twisted, the object being merely to keep one fleece separate from another. String composed of vegetable matter, such as hemp, jute, &c., is bad, and ought not to be used. Most farmers tie up their fleeces with wool bands, and have done so for generations, except in a few western and southern counties. In the latter the use of string (and frequently the worst kind of string, such as reaper or binder twine) is not uncommon. This use of string is unprofitable to all the parties concerned. The amount of damage done is a very serious matter to the manufacturer, and the district from which such wool comes suffers in reputation.

The rotting or fermentation of ripe fruit was proved by Pasteur to be due to the presence of living organisms—fungi and bacteria on the surface.

A Method of Preventing the Rapid Decay of Ripe Fruit.

From this starting-point it was inferred that if these organisms could be destroyed the period during which such fruit could be kept in a perfect condition could be considerably prolonged; and a series of experiments conducted in the Jodrell Laboratory at Kew proved the inference to be correct.

The fruits experimented upon were ripe cherries, gooseberries, grapes, pears and strawberries. The fruit was not selected but purchased from shops, or in some instances from vendors in the street.

The following table shows the number of days during which the fruit, after special treatment, remained perfectly sound, after a similar quantity of untreated fruit from the same lot had become mouldy or decayed :—

Cherries	7 days.
Gooseberries	7 ,,
Grapes	4 ,,
Pears	10 ,,
Strawberries	4 ,,

The above table applies in all cases to fruit that was perfectly ripe when experimented upon, but it was ascertained that if fruit is treated before it is quite ripe it is equally well preserved, and the normal course of ripening and the flavour are not in any way interfered with, as is the case where fruit is kept for some time in a refrigerator.

This fact suggests that the method of fruit preservation described here, although valuable in extending the duration of home-grown fruit in good condition, will eventually prove to be of the greatest importance in enabling our markets to be stocked with many delicious kinds of tropical fruit, which under present conditions never reach us. A careful examination of ripe fruit from the West Indies, intended for exhibition at the Crystal Palace in connection with the Colonial Produce Exhibition, showed very clearly that the decay of such fruit as mangos during the voyage, was due entirely to mouldiness and fermentation set up by fungi and bacteria that were present on the surface of the fruit before shipment, and not to an inherent

tendency to decay or to become over-ripe on the part of the fruit.

It is common knowledge that the decay of ripe fruit originates from bruises or wounds on the surface, and thence rapidly spreads both internally and over the surface. Unfortunately it is not so generally known, although equally true, that the decay of the bruised or wounded part is entirely due to the presence of the germs of fungi or bacteria, which develop rapidly, feeding on the sugar or other substances liberated from the bruised tissue. Fermentation and decay follow and quickly spread from one fruit to another.

Similar treatment might be applied with advantage to certain tropical fruits that do reach us in fairly good condition, as bananas, where too frequently the unsightly and injurious blackened "skin," caused by an external fungus, could be easily prevented. Apples, pears, oranges, lemons, &c., would also repay similar treatment.

The method of treatment described below is very simple, inexpensive, and perfectly free from danger.

In the case of fruits where every part is eaten, as strawberries, &c., the fruit should be immersed for ten minutes in cold water containing 3 per cent. of commercial formalin (= 40 per cent. of formaldehyde). On removal immerse the fruit for five minutes in cold water, and afterwards place it on wire-netting or some similarly open material to drain and dry.

When the fruit has a rind or "skin" that is not eaten, the immersion in water after treatment in the formalin solution can be omitted with advantage.

Various other preservatives were tested, but when the whole of the requisite points—efficiency, ease of application, cheapness and absolute freedom from danger arising from its use—were taken into consideration, formalin stood first.

Beetles on Strawberries.

The family of Ground Beetles is one which on account of the carnivorous habits of the majority of its species is considered economically useful; but there are three species, viz., *Harpalus ruficornis*, *Pterostichus vulgaris*, and *Pterostichus madidus*, which are well known and proved enemies of strawberries and

other fruit, and one (*i.e.*, the last named) injures field crops, *e.g.*, mangolds; their larvæ, however, are carnivorous as well as vegetarian.

These beetles live in the day-time in holes in the soil or in litter on the fruit bed. Anything that would disturb them in their day shelter-places would be useful; those disturbed and collected could be killed by their being dropped into boiling water or into a little paraffin.

The proved practical remedial measure is to trap the beetles by placing here and there smooth-sided basins baited with some attractive sweet stuff. Two out of the three above species are wingless and once in the traps are unable to get out owing to their inability to get a grip on the slippery sides. As to trapping, Miss Ormerod quotes Messrs. Laxton, of Bedford, as follows:—

"We purchased a large quantity of cheap pudding-basins early this spring; these are let into the ground level with the surface, at distances a few yards apart, and kept baited with pieces of lights and sugar-water. When the weather was dry we often caught half-a-basinful of a night until the number gradually diminished to two or three and now none at all. It is laborious but well worth the trouble, as this season we lost no fruit."

Larch Canker.

This destructive parasite (*Dasyscypha calycina*) is present in greater or less quantity, depending on local conditions, wherever the larch (*Larix europæa*) grows. In this country it also occurs on the Scots pine (*Pinus silvestris*), the silver fir (*Abies pectinata*), the Corsican pine (*Pinus laricio*), and the Japanese larch (*Larix leptolepis*).

The fungus is a wound-parasite; in other words, it cannot gain an entrance into the tissues of a living tree except through a wound. The wounds ordinarily occurring in nature through which infection takes place, may be grouped under four headings:—(1) Wounds caused by wind, or by snow resting on the branches; (2) cracks caused by late frosts; (3) nibbling of the bark by rodents or by insects, and more especially the punctures made by the larch aphis (*Chermes laricis*); (4) wounds made near the base of the stem in planting.

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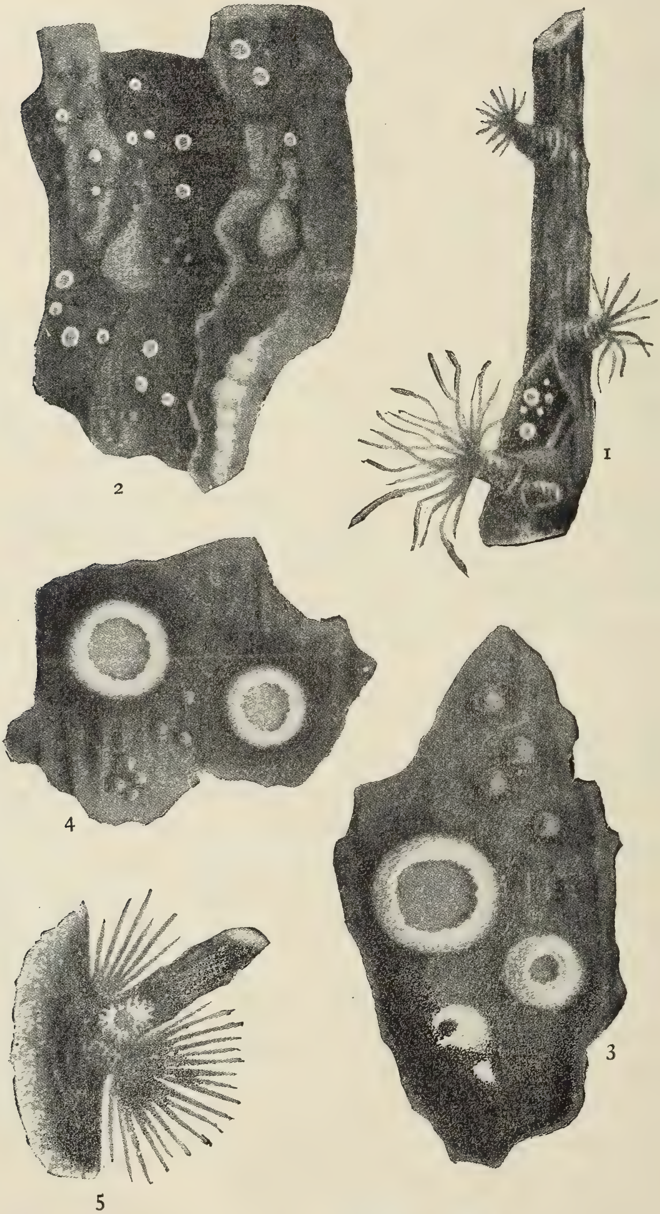

LARCH AND SPRUCE CANKER.

The general appearance of the fungus and the injury and resin-flow following its attack are clearly shown in the accompanying illustration.

As a broad rule, it may be stated that when trees under ten years of age are attacked by canker, they are either killed outright, or are so deformed that if they continue to grow they are of very little value for timber. The reason is that in the case of seedlings or very young trees, the main stem is the part usually attacked, whereas in older trees the bark of the trunk becomes so rigid that it is impervious to the punctures of aphides or to injury by late frosts ; and the only chance of infection is when branches are broken off, or more or less cracked at the point where they leave the trunk.

When a young tree is once attacked it very rarely recovers, as the mycelium spreads in the tissues and starts new wounds at some distance from the original point of infection.

As a safeguard against inoculation taking place through fissures in the bark caused by late spring frosts, it is advisable not to form seed-beds nor plant larch in low-lying damp positions, where not only are the plants most exposed to frost, but the conditions favour the presence of the aphis.

Seedlings and young trees can be protected against the larch aphis by spraying with the following emulsion :—Dissolve half a pound of soft-soap in two gallons of hot water, then add two gallons of paraffin, and mix thoroughly until the ingredients do not separate on standing. One gallon of this stock emulsion should be diluted with fourteen gallons of water ; it is then ready for use.

The rank growth of grass and weeds round young trees greatly favours the development and spread of canker by keeping them constantly moist.

Trees that are badly diseased should be removed and burned.

Great care should be taken not to injure the bark of young plants when lifted from the nursery, or in planting, as is often done when the turf is pressed firmly round the stem by the heel of the planter.

A rather more detailed account of this disease, illustrated by one coloured and two other plates appeared in the *Journal* in September, 1902.

Description of the Figures.

1. Portion of stem of young larch, showing a small canker-wound with the fungus. Natural size.

2. A small but characteristic canker, with the fruiting fungus present. Natural size.

3. The two forms of the fruit of the canker fungus. Enlarged.

4. *Dasyscypha resinaria*, a fungus, forming canker on the spruce fir.

5. Portion of a larch branch showing the white flocculent tuft with a central drop of sap, which is constantly to be found near a "foundress" aphis with eggs. Spores of the canker-fungus often germinate in these drops of sap produced by the aphis, and start a canker spot.

Report of the Agricultural Organisation Society.

The Board have received a copy of the fourth Report of the Agricultural Organisation Society, from which it appears that the number of affiliated societies at the end of 1904 was 106, as against 73 in the previous year, and 40 in 1902. This number included 72 societies combining the supply of requirements and sale of produce, 12 dairy societies, 11 co-operative credit banks, two rural industry societies, five allotment and small holding societies, one cattle auction market, and three miscellaneous societies.

The movement had spread into 12 new counties, making 30 counties in all, and it is estimated that the membership had risen from about 4,500 in 1903 to about 6,500 in 1904.

During 1904 an Advisory Business Department was established for the purpose of assisting affiliated societies to buy and sell advantageously. It is not a trading body, but it negotiates with manufacturers of fertilisers, feeding-stuffs, and other agricultural requirements, and with seed merchants, and arranges the terms upon which they will deal with the societies. It obtains quotations for the commodities required by the societies, and advises them which quotations to accept. When asked to do so, it places orders for the societies, but accepts no responsibility for payment of the amount of the orders, and charges no commission for its services.

It is in the establishment of societies for the purchase and sale of produce, of which 24 were started during the past year, that the greatest development has taken place. In the purchase of agricultural requirements much progress has been made, manufacturers, colliery owners, importers, and others having shown an increased readiness to do business with the affiliated societies on wholesale terms. By doing business in this way with reliable firms, not only are intermediate profits saved, but the societies are safeguarded to a very considerable extent against the purchase of articles which are not always what they are represented to be. Although it may be true that in the case of a few standard articles the farmer who is prepared to give a £50 or £100 order and pay cash can sometimes obtain them at prices very little more than those at which a co-operative society can at present buy, yet even such farmers seldom take the trouble to see that the goods are of the quality asked for, and in many cases buy articles which are certainly not worth the price paid, while smaller farmers suffer both from uncertainty as to quality, and from largely increased prices.

In spite of the great improvement that has taken place during the last few years in the genuineness, purity, and general quality of the articles supplied to farmers, there are, the Report observes, still many cases of the use of impure materials, of the admixture of worthless ingredients, and of the selling of articles under names and analytical statements which are distinctly misleading. Many farmers have not the necessary knowledge individually to examine thoroughly and compare the prices and articles they are offered, but upon the committee of a co-operative society there are sure to be men, one or more of whom thoroughly understand cakes, while others understand manures, seeds, &c. The members of a society thus have the benefit of the knowledge of others, and in the case of an article turning out inferior to that which was bought, the society can take action with much more authority than an individual.

In such matters as these the protection against fraud, and the consequent reliability of the articles obtained are of far greater value to the farmer than a shilling or two reduction in price. For example, it has become common for cake makers,

instead of giving a detailed analysis of the cakes they sell, simply to make some such statement as the following: "Contains a minimum of 64 per cent. of oil, and fat and flesh formers." Such a statement would apply equally to a cake made of weed seeds, screenings, and other rubbish, or of the best linseed. Societies should always, and very often do, insist on a proper guarantee of the percentage of oil and albuminoids, and of the freedom of the cake from any deleterious ingredients. There are also many compounded feeding-stuffs sold at prices far above their true value as calculated by the food units they contain.

Co-operation for sale has not progressed to the same extent as co-operation for purchase, but a number of societies exist which have been very successful in dealing with the sale of dairy produce, eggs, poultry, and other produce. An account of the work of some of the co-operative dairying societies was given in the previous number of this *Journal* (July, 1905).

Some particulars of another side of the societies' work, viz., the promotion of agricultural credit banks, have also been given recently in this *Journal* (June, 1905, p. 154), but among the proposed developments is the establishment of a Central Finance Society, from which credit societies can draw money to lend to their members, and in which any surplus money they may have in hand may be deposited. It is also hoped that means will be found to establish a co-operative credit system which will meet the requirements of the larger farmers.

The Report contains the returns received from the societies showing the number of members, share capital, sales, profit and loss, &c., together with other information relating to the working of the Agricultural Organisation Society in the past year.

ADDITIONS TO THE LIBRARY DURING JULY.

Africa—

Cape of Good Hope.—Conservators of Forests. Reports for 1903-4. (176 pp.)
Cape of Good Hope.—Wine and Brandy Industry of Cape Colony, Report of Committee. (98 pp.) 1905.

Australasia—

South Australia.—Agricultural and Live Stock Statistics for 1903-4. (91 pp.) 1904.
South Australia.—Minister of Agriculture, Report for 1903-4. (22 pp.) 1904.

Canada—

Central Experimental Farm.—Potato and its Culture (with lists of varieties found most useful). (48 pp.) 1905.

Denmark—

Falbe-Hansen, V. og *Scharling, W.*—Danmarks Statistik. 5 vols. (782 + 780 + 550 + 554 + 420 pp.) 1878-1887.—Supplementary Volume, Danmark i 1890. (633 pp.) 1891.

France—

Marré, E.—La Lutte contre la Cuscute. (27 pp.) 1905.
Sanson, A.—Traité de Zootechnie. (5 vols.) (401 + 386 + 366 + 376 + 350 pp.) 1901.

Germany—

Graebner, P.—Handbuch der Heidekultur. (296 pp.) 1904.
Gerhardt, P.—Handbuch des deutschen Dünenbaues. (656 pp.) 1900.
Kirchner, O.—Die Krankheiten und Beschädigungen unserer landwirtschaftlichen Kulturpflanzen. (96 pp.) 1905.
Kissling, R.—Handbuch der Tabakkunde, des Tabakbaues und der Tabakfabrikation. (368 pp.) 1905.

Great Britain—

Stein, Sigmund.—Sugar Beet Growing Experiments in Great Britain and Ireland, 1904. (11 pp.)
Strawson, G. F.—Part I. Standard Fungicides and Insecticides in Agriculture. (76 pp.) 1903.—Part II. Insects and Fungi Injurious to Plants. (201 pp.) 1905.
West of Scotland Agricultural College:—
Experiment on the Feeding of Dairy Cows, Report. (160–198 pp.)
Experiments on the Seeding of Pastures, Report. 1901-4. (13-36 pp.)
Experiments on the Improvement of Poor Permanent Pasture. (37–68 pp.)
Woburn Experimental Fruit Farm.—Fifth Report. (121 pp.) 1905.

India—

Agra and Oudh.—Department of Land Records and Agriculture, Report, 1903-4. (22 pp.) 1905.
Straits Settlements.—Botanic Gardens, Singapore and Penang, Report for 1904. (15 pp.)

Italy—

Istituto internazionale d'Agricoltura. Studi e Documenti. (732 pp.) 1905.
Ministero di Agricoltura.—Notizie sommarie sulle Irrigazioni in Italia. (42 pp.) 1905.
Stringher, V.—Notizie sull' Italia Agricola. (147 pp.) 1905.

Norway—

Aarsberetning angaaende de offentlige Foranstaltninger til Landbrugets Fremme, 1904. I. Statsforanstaltninger. (593 pp.) 1905.

Russia—

Resultats généraux de la Récolte en Russie, 1904. (53 pp.)

South America—

Uruguay.—Annuario Estadistico, 1902 and 1903. Tome I. (763 pp.)

United States—

Department of Agriculture.—Year Book for 1904. (776 pp.)
Bureau of Animal Industry.—Regulations of the Secretary of Agriculture governing the Inspection, &c., of Live Stock which is the subject of interstate commerce. (27 pp.) 1905.
Circular 78. Glanders and Farcy. (12 pp.) Reprinted from "Special Report on Diseases of the Horse." 1903.
Bureau of Chemistry :—Bull. 92. Effect of Water on Rock Powders. (24 pp.) 1905.
Bureau of Entomology :—
Circ. 61. Black Check in Western Hemlock. (10 pp.) 1905.
Circ. 62. Cabbage Hair-Worm. (6 pp.) 1905.
Bull. 50. Cotton Bollworm. (155 pp. + xxv. plates.) 1905.
Bull. 51. The Mexican Cotton Boll Weevil (Revision of Bull. 45). (181 pp.) 1905.
Bull. 52. Proceedings of the Annual Meeting of the Association of Economic Entomologists, December, 1904. (123 pp.) 1905.
Office of Experiment Stations.—Bull. 154. Proceedings of the Annual Meeting of the American Association of Farmers' Institute Workers, October, 1904. (89 pp.)
Farmers' Bulletin No. 220 :—Tomatoes. (32 pp). 1905.
No. 223. Miscellaneous Cotton Insects in Texas. (24 pp.) 1905.
No. 224. Canadian Field Peas. (16 pp.) 1905.
No. 225. Experimental Station Work, XXIX. (32 pp.)
No. 226. Relation of Coyotes to Stock Raising in the West. (24 pp.) 1905.
Bureau of Forestry :—
Circ. 34. Practical Results of the Cup and Gutter System of Turpentining. (7 pp.) 1905.
Bull. 60. Report on an Examination of a Forest Tract in Western North Carolina. (32 pp.) 1905.
Bureau of Plant Industry :—
Bull. 72. Miscellaneous Papers. I. Cultivation of Wheat in Permanent Alfalfa Fields. (5–7 pp.)—II. Salt Water Limits of Wild Rice. (8–14 pp.)—III. Extermination of Johnson Grass. (15–22 pp. and 3 plates.)—IV. Inoculation of Soil with Nitrogen-Fixing Bacteria. (23–30 pp.) 1905.
Bull. 77. Avocado : A Salad Fruit from the Topics. (49 pp. + viii. plates.) 1905.
Bureau of Soils :—Bull. 27. Experiments in Growing Cuban Seed Tobacco in Texas. (44 pp.)
Connecticut Agricultural Experiment Station.—Report for 1904. (482 pp.)
Massachussetts State Board of Agriculture.—Report, July–December, 1904. (251-324 pp.) 1905.
Wisconsin Agricultural Experiment Station.—Report for 1903-4. (392 pp.) 1904.
Bull. 123. Beet Sugar Industry of Wisconsin. (69 pp.) 1905.
Bull. 124. Tobacco Investigations in Wisconsin. Report for 1903-4. (45 pp.) 1905.
Bull. 125. Silo Construction. (92 pp.) 1905.
Bull. 126. Two Ways of Treating Tuberculosis in Herds. (15 pp.) 1905.

West Indies—

Department of Agriculture, West Indies.—Cultivation of Oranges in Dominica. (52 pp.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of July, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 10	7 4	36 10	34 4
Herefords	7 11	7 3	—	—
Shorthorns	7 8	7 2	35 11	33 4
Devons	7 10	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7½	6¾	8	6
Sheep :—				
Downs	8¼	7¾	—	—
Longwools	7½	7	—	—
Cheviots	8½	8	8½	7¾
Blackfaced	8	7¼	8	7¼
Cross-breds	8	7½	8¼	7¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 4	5 9	6 2	5 6
Porkers	6 8	6 3	6 9	6 0
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 7	17 2	20 16	16 14
,, —Calvers ...	19 9	16 1	21 4	16 15
Other breeds—In Milk ...	20 0	15 8	19 1	15 15
,, —Calvers ...	21 6	14 9	18 14	15 8
Calves for Rearing	2 2	1 13	2 9	1 14
Store Cattle :—				
Shorthorns—Yearlings ...	8 16	7 15	9 8	8 2
,, Two-year-olds	12 19	11 6	13 16	12 5
,, Three-year-olds	16 2	13 18	—	—
Polled Scots—Two-year-olds	—	—	15 1	12 16
Herefords— ,,	—	13 17	—	—
Devons— ,,	12 16	11 9	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	34 0	29 0	—	—
Scotch Cross-breds ...	—	—	34 3	31 6
Store Pigs :—				
Under 4 months	25 0	19 0	24 6	18 9

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF:—							
English	1st	53 0	51 6	53 0	49 0	55 6*	53 6*
	2nd	51 0	47 0	48 6	46 0	53 6*	49 0*
Cow and Bull ...	1st	—	45 0	43 6	42 0	44 6	42 0
	2nd	—	38 6	39 0	37 6	39 0	35 0
U.S.A. and Canadian:—							
Birkenhead killed	1st	50 6	50 6	49 0	49 0	—	50 6
	2nd	47 0	46 6	46 0	45 6	42 0	43 0
Argentine Frozen—							
Hind Quarters ...	1st	31 0	31 6	30 6	33 0	30 6	30 6
Fore ,, ...	1st	22 0	22 0	21 0	21 0	21 0	21 6
Argentine Chilled—							
Hind Quarters ...	1st	42 0	44 6	40 6	39 6	—	44 6
Fore ,, ...	1st	28 6	27 0	25 6	25 6	—	30 0
American Chilled—							
Hind Quarters ...	1st	56 0	55 0	53 6	53 6	56 0	56 0
Fore ,, ...	1st	34 6	31 6	31 6	32 0	32 6	33 0
VEAL:—							
British	1st	60 6	58 6	60 6	70 0	—	60 6
	2nd	52 6	45 0	49 0	60 0	—	—
Foreign	1st	60 6	—	—	—	—	52 6
MUTTON:—							
Scotch	1st	71 6	—	70 6	71 0	73 0	71 0
	2nd	68 0	—	65 6	64 6	64 6	62 6
English	1st	68 0	67 6	65 6	65 6	—	—
	2nd	62 6	53 0	60 6	58 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	60 6	60 6	60 6	—	—
Argentine Frozen ...	1st	33 0	34 6	33 0	32 6	32 6	33 0
Australian ,, ...	1st	31 6	31 0	32 0	31 6	32 6	—
New Zealand ,, ...	1st	43 6	46 6	45 0	46 6	35 0	—
LAMB:—							
British	1st	80 0	71 6	71 0	71 0	81 6	78 0
	2nd	74 0	66 6	64 6	63 0	76 0	69 6
New Zealand ...	1st	54 0	55 0	52 0	52 0	55 0	56 0
Australian	1st	50 0	50 0	49 0	49 0	46 6	—
Argentine	1st	—	49 0	49 0	49 0	—	46 6
PORK:—							
British	1st	56 6	55 0	56 0	56 0	55 0	49 0
	2nd	49 6	46 0	—	—	53 6	41 0
Foreign	1st	52 0	52 6	51 6	51 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ...	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1	30 8	22 5	19 10	24 10	18 4	16 6	18 3
,, 20 ...	27 10	26 9	30 10	23 7	20 4	24 8	18 5	16 7	18 5
,, 27 ...	27 8	26 9	30 11	23 7	19 8	24 4	18 5	16 7	18 8
June 3 ...	27 6	26 10	31 3	23 10	18 8	23 6	18 4	16 8	19 1
,, 10 ...	27 8	26 6	31 4	21 5	18 5	24 0	18 7	16 10	18 11
,, 17 ...	27 6	26 5	31 7	20 7	18 2	26 0	18 3	16 8	19 1
,, 24 ...	27 6	26 5	31 7	22 0	19 2	23 9	18 6	16 10	18 10
July 1 ...	27 9	26 4	31 8	20 7	18 8	23 2	18 6	17 1	19 7
,, 8 ...	28 1	26 6	32 1	19 11	19 8	22 11	18 3	17 1	19 6
,, 15 ...	28 3	26 10	32 3	20 5	18 9	23 10	18 7	17 6	19 7
,, 22 ...	28 7	27 7	32 2	20 10	18 10	23 7	18 5	17 6	18 11
,, 29 ...	28 11	28 0	32 3	21 0	19 9	23 11	18 6	17 10	19 3
Aug. 5 ...	29 3	28 3	31 11	20 1	19 9	22 0	18 8	17 10	18 4
,, 12 ...	29 11	28 4		21 3	19 9		18 10	17 7	
,, 19 ...	29 9	28 8		20 4	22 5		18 6	16 7	
,, 26 ...	30 0	29 5		22 3	23 2		18 7	16 5	
Sept. 2 ...	30 3	30 2		22 5	25 3		18 5	16 3	
,, 9 ...	28 6	30 0		22 4	24 10		17 0	16 1	
,, 16 ...	27 5	29 7		24 2	24 9		16 4	15 11	
,, 23 ...	27 0	29 10		24 0	25 10		16 2	15 9	
,, 30 ...	26 3	29 10		23 9	25 5		15 9	15 8	
Oct. 7 ...	25 10	30 2		23 8	25 6		15 6	15 9	
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ...	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	June ...	34 9	41 0	21 5	25 3	16 0	21 6
	July ...	34 7	40 10	21 1	25 5	15 11	21 8
Paris:	June ...	34 7	42 5	20 5	26 3	15 11	23 1
	July ...	35 2	42 4	20 4	26 2	16 8	22 10
Belgium:	May ...	30 0	34 4	21 5	23 10	15 6	21 2
	June ...	29 11	31 8	20 8	24 0	17 4	21 8
Berlin:	May ...	38 4	38 2	—	—	17 4	19 9
	June ...	37 10	37 11	—	—	18 5	20 0
Breslau:	May ...	37 3	35 3	22 3	25 7	16 2	19 4
	June ...	37 10	35 2	22 5	24 6	17 1	19 3

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of July, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	26 3	32 10	18 5	—	17 11	20 1
Norwich	27 0	31 10	22 0	22 9	16 2	18 7
Peterborough ...	25 9	31 5	18 8	—	16 4	19 5
Lincoln	26 3	31 4	17 5	22 9	16 5	—
Doncaster	25 10	30 10	—	—	17 5	18 8
Salisbury	26 7	32 2	18 9	—	17 4	19 11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	13 0	12 3	—	—	—	—	13 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	104 0	99 6	107 0	103 6	104 0	101 6	104 0	—
Danish ...	112 6	111 0	116 0	113 6	114 0	111 6	103 0	—
Russian ...	98 6	96 0	107 6	103 6	95 6	93 6	97 6	—
Canadain ...	102 0	98 0	104 6	99 6	102 6	101 0	103 6	—
Argentine ...	103 6	100 0	101 0	99 0	—	—	—	—
CHEESE :—								
British, Cheddar	74 0	66 0	—	—	66 6	61 6	52 6	48 6
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	53 0	43 6	54 0	50 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	49 6	48 6	49 6	48 6	49 0	47 6	49 6	48 0
BACON :—								
Irish	69 0	64 6	68 6	63 6	67 0	62 0	66 0	64 0
Canadian ...	58 6	55 6	55 0	52 6	55 6	52 0	56 0	51 0
HAMS :—								
Cumberland ...	100 0	91 0	—	—	—	—	—	—
Irish	104 0	92 6	—	—	—	—	102 0	92 0
American (long cut) ...	55 0	52 0	54 0	48 6	54 6	48 0	55 6	52 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	10 5	9 7	—	—	—	—	—	—
Irish	9 9	8 0	8 3	7 5	8 1	6 8	7 8	7 1
Danish ...	9 6	8 0	9 4	7 1	8 10	8 4	8 7	7 9
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	65 0	60 0	—	—	60 0	—	—	—
Main Crop ...	—	—	—	—	80 0	70 0	—	—
Up-to-Date ...	70 0	60 0	—	—	75 0	70 0	—	—
HAY :—								
Clover... ...	81 6	72 6	87 0	71 6	80 0	67 6	73 6	68 6
Meadow ...	74 0	69 0	68 0	63 0	—	—	72 0	63 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	July.		7 Months Ended July.	
	1905.	1904.	1905.	1904.
Swine-Fever:—				
Outbreaks	93	97	515	895
Swine Slaughtered as diseased or exposed to infection ...	381	375	2,405	4,238
Anthrax:—				
Outbreaks	57	64	592	591
Animals attacked	74	89	845	907
Glanders (including Farcy):—				
Outbreaks	94	139	715	908
Animals attacked	168	246	1,249	1,633
Sheep-Scab:—				
Outbreaks	5	4	648	1,060

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	July.		7 Months Ended July.	
	1905.	1904.	1905.	1904.
Swine-Fever:—				
Outbreaks	12	35	30	108
Swine Slaughtered as diseased or exposed to infection ...	379	557	846	2,430
Anthrax:—				
Outbreaks	—	—	2	2
Animals attacked	—	—	2	2
Glanders (including Farcy):—				
Outbreaks	—	3	12	8
Animals attacked	—	3	33	24
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	3	3	225	368

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XII. No. 6.

SEPTEMBER, 1905. [NEW SERIES.]

THE NATIONAL FRUIT AND CIDER INSTITUTE AND ITS WORK.

Rather more than a year has elapsed since the National Fruit and Cider Institute started its work, and it is now possible to give some account of the nature of the work which it is carrying on. Particulars of the origin and the objects of the Institute have already been published in the *Journal* of the Bath and West and Southern Counties Agricultural Society, and it is not proposed here to make more than a brief mention of them. The Institute may be said to owe its origin primarily to the experimental work on cider carried on at Butleigh in connection with the Bath and West Society, aided financially also by grants made by the Board of Agriculture. The question of the advisability of an extension of this work led the Board to take a lead in the matter. After the interest of many of the County Councils of the West and South of England had been enlisted, it was resolved to establish an Institute where experimental work on cider and perry should be conducted and educational work connected therewith undertaken. It was also deemed desirable to include among the objects of the Institute investigations and demonstrations of the best methods of cultivation of all kinds of fruit and vegetables, the improvement of the present varieties and the introduction of new varieties, and the promotion of the general interest of farmers, fruit-growers and others connected with the growth and use of fruit and vegetables.

The Institute has been established at Long Ashton, near Bristol, this locality having been selected on account of its

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central position in the cider-making districts. The buildings previously in existence on the site have been altered and added to according to the requirements of the work, and land adjoining to the extent of about 14 acres has been acquired. One section of the buildings is occupied by the cider mill and press, the press being on the ground floor and the mill fixed into the floor of the room above the press. This room is used as an apple store, and a considerable saving of labour is effected by this arrangement, since the apples can be passed directly into the mill and the pulp conducted by means of a copper chute on to one of the beds of the press underneath, where the "cheese" is built up. There are two beds to the press, and these are reversible, so that while one "cheese" is being pressed another can be made up. The construction of the mill is such that the fruit is grated or scratched into a fine pulp. The cider plant is of a modern type, and its principal characteristics are speed in working and a large yield of juice, the latter being probably mainly due to the fine state of division of the pulp.

Adjoining the press room is the engine house, containing a steam engine, which is used for driving the mill and working the press, and a boiler, to which is attached a steam-pipe passing into the wash-house. The latter is a large roofed and paved structure with open sides, specially suited for steaming and washing casks and other utensils used in cider-making, and also admirably adapted as an open-air fermentation room. The apple juice during its early stages of fermentation is usually kept in the keeving room, which adjoins the apple loft and stands over the cellar. The juice, after flowing from the press into a slate tank sunk in the floor of the press room, is pumped into large open casks or keeves in the keeving room, and remains there until it is desired to rack it off into the storage casks in the cellar beneath. Here, again, a saving of labour is effected, since the racking can be accomplished by means of a siphon. The cellar is situated on the ground floor in the interior of the building, being thus protected to a considerable extent against sudden changes of temperature.

The laboratory has been built along the western wall of the cellar, and is fitted up with the apparatus necessary for the biological and chemical work.

An adjoining cottage has also been rented. It is utilised as a storehouse for fruit and bottled cider.

It will thus be seen that the Institute is adapted for experimental work on cider and perry not only of a strictly scientific character and on a small scale, but also of a thoroughly practical nature on a scale sufficiently large for it to serve as a test of its utility for general application in the cider industry.

Last season about 30 tons of apples and pears were utilised for cider and perry-making. The fruit was obtained partly from

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an old orchard attached to the Institute, and the remainder was purchased from the fruit-growing districts of the counties which contribute grants to the Institute. In obtaining the latter portion it was desired to procure fruit as typical as possible of the vintage fruit grown in the counties concerned, in order that some knowledge might be gained of the characters of the fruit of the cider districts of the West of England as a whole. Up to the present time such knowledge has been extremely limited, few cider-makers being acquainted with the cider fruit grown outside their own district. A very large number of varieties of apples are used

for cider, and in most cases their distribution is quite local. A comprehensive acquaintance with the vintage fruit of this country is urgently needed, so that the cultivation of the most valuable varieties may be extended, and the indifferent varieties—of which there are undoubtedly many—gradually replaced. An extensive field of work lies in this direction, and the investigations ought, in course of time, to result in the improvement of the quality of cider fruit.

An endeavour was made to obtain six different varieties of apples from each of the contributing counties in quantities sufficient to make a hogshead of cider of each kind, the intention being to make cider from each variety separately, to keep samples of all these ciders, so that an idea could be formed of the kind of cider resulting from each variety of apple, and to utilise the remainder for experiments in blending. By this method it was hoped to determine the exact value of the varieties obtained for cider-making purposes, whether for blending or for use alone. The selection of the varieties from each county was made in every instance by experts thoroughly acquainted with the varieties of the respective counties. In all, twenty-eight varieties of apples and four varieties of pears were obtained. The table on page 325 gives particulars of each, and may be considered as representative of the chemical and other qualities of standard vintage fruits of the West of England.

The method of cider-making adopted was that which had been found to give the best results in earlier experimental work, and was substantially the same for each variety of apple, in order that the results might not in any way be due to variations of the processes of treatment. Since this was the first occasion on which it had been possible, for experimental purposes, to obtain sufficient fruit of individual varieties to produce a requisite bulk of cider from each kind separately, it was considered desirable to study their characters in this manner rather than to proceed directly with further investigations relating to practical methods of treatment. The details of the method adopted were, briefly, as follows :—The fruit, before being allowed to pass through the mill, was freed, as far as possible, from extraneous matter, such as leaves and stones ; the pulp was twice pressed, and the juice from both pressings mixed and

pumped into a large keeve or open cask; it remained there until, after repeated skimmings, no further head formed, after which it was siphoned carefully into barrels in the cellar; these barrels, after being filled, were bunged down and fitted with vent tubes, air being thus excluded and an outlet allowed for the gases produced in the course of fermentation. At regular

County.	Name of Variety.	Percentage of Juice.	Specific Gravity of Juice.	Percentage Composition of Juice.			
				Solids.	Acids.	Sugars.	Tannins.
	APPLES.						
Devon.	Fair Maid of Devon ...	77	1·040	10·50	·75	9·00	·088
Devon.	Kingston Black ...	78	1·058	14·70	·49	13·10	·326
Devon.	Northwood	85	1·047	11·42	·30	10·78	·180
Devon.	Sweet Alford	83	1·050	12·56	·16	10·78	·118
Devon.	Woodbine	76	1·050	12·52	·15	11·20	·210
Gl'ster.	Gloucester French ...	75	1·058	14·44	·85	13·10	·298
Gl'ster.	Red Soldier	76	1·059	15·76	·81	12·62	·316
Gl'ster.	White Styre	85	1·040	9·86	·46	9·40	·124
Hereford.	Cherry Norman ...	68	1·052	14·42	·16	12·19	·426
Hereford.	Kingston Black ...	94	1·059	14·76	·49	12·93	·226
Hereford.	Knotted Kernel ...	75	1·055	14·00	·16	12·03	·476
Hereford.	Red Foxwhelp... ...	75	1·042	10·04	·66	9·55	·200
Hereford.	Strawberry Norman ...	81	1·061	14·86	·18	14·17	·650
Hereford.	White Norman ...	77	1·050	12·68	·15	11·74	·342
Monmouth.	Broad Styre	84	1·054	12·50	·87	12·17	·176
Monmouth.	Fredericks	81	1·051	12·84	·85	10·24	·074
Monmouth.	Pytheres	84	1·057	14·12	·28	11·76	·228
Monmouth.	Worcester Red... ...	83	1·048	11·68	·58	10·04	·102
Somerset.	Broadleaf	77	1·057	13·66	·29	13·98	·400
Somerset.	Cap of Liberty... ...	75	1·062	15·82	1·01	11·89	·296
Somerset.	Dabinet	78	1·055	13·80	·13	13·61	·284
Somerset.	Harry Masters Jersey...	68	1·065	16·18	·18	15·04	·354
Somerset.	Royal Jersey	78	1·072	18·14	·17	16·17	·700
Somerset.	Yarlington Mill Jersey	82	1·051	12·72	·19	12·17	·354
Worcester.	Brownthorn	85	1·050	12·34	·16	11·76	·238
Worcester.	Cherry Norman ...	73	1·052	13·60	·15	12·03	·382
Worcester.	Strawberry Norman ...	83	1·049	12·08	·18	11·25	·274
Worcester.	White Norman ...	72	1·050	12·90	·16	11·89	·360
	PEARS.						
Gl'ster.	Butt	73	1·047	11·62	·53	10·04	·182
Gl'ster.	Oldfield	82	1·067	15·88	·57	12·77	·076
W'ster.	Oldfield	75	1·064	16·90	·59	13·61	·140
W'ster.	Red Longland... ...	76	1·046	10·82	·33	7·80	·096

intervals small quantities of the fermenting juice were drawn off and tested, so that records of the rate of fermentation could be kept. When fermentation had proceeded as far as required, the liquid was racked into another barrel and filtered after a short interval, during which solid matter had an opportunity to settle. From the filter the liquid was conveyed to storage casks, which were completely filled and then tightly bunged down; in

these the cider was allowed to mature and remain undisturbed until it was required for sampling and blending.

It may be of interest to indicate here some of the general results already obtained from this work, for details of which readers are referred to the reports issued by the Institute. As was anticipated, cider made from a single variety of apple is not of a high quality in general, but occasionally it is very good. In some instances the product is unpalatable, but of such a nature that it is valuable as a component of a blend. In other cases of unpalatable ciders, the disagreeable features are such that they lower the quality of any blend of which the cider may form a part. The varieties of apples which yield the latter class of ciders must be condemned as valueless or actually harmful for cider-making purposes, if future tests confirm the original results. Thus it may be stated that the quality of a cider depends primarily on the varieties of apples used. As a result, therefore, it becomes a matter of the first importance to gain an exact knowledge of the characters of the varieties.

The question arises, then, What are the characters of any variety which determine its value? At the present stage of the work, there appear to be three features of primary importance, viz., the chemical composition, the flavour, and the rate of fermentation of the juice. Of these the flavour is probably the only constant factor, the others being affected by such influences as the nature of the season and soil and the degree of ripeness of the fruit. Further study as to the nature and degree of such influences is necessary before the relative importance of the individual features, as characteristic of the variety, can be determined. If, however, instead of considering the variety in a general manner, a single definite sample of fruit of the variety be taken into consideration, it is possible to make some positive statements as to the nature and degree of value of each of the three characters. Dealing first with the "chemical composition" of the juice, it should be mentioned that this term is used here in a restricted sense, with application only to the three groups of substances—sugars, acids, and tannins—which are generally admitted to be the most important constituents of the juice. Hitherto it has been customary, both in this and other countries, to estimate the value and the quality of any

juice (or apple) almost entirely by the amounts of these substances contained in it. The results of the work of the past season at the Institute clearly indicate that the relative value of this factor can be much over-estimated; and, indeed, if used alone as a standard, will lead to fallacious results. One of the poorest ciders at the Institute was made from apples which, judged solely from the chemical standpoint, should have yielded one of the best. It was perfectly sound and clean, and owed its objectionable character entirely to the second of the

THE WASHING-UP SHED.

above-mentioned characters, the flavour of the apple. This term is also used in a restricted sense, what might be termed the "gross" flavour, due to the relative amounts of sugars, acids, and tannins, being excluded from the meaning, and reference only being made to the more delicate characters contributed by the presence of minute quantities of fruit ethers and similar substances. Included in this term also is another character distinct, possibly, for each variety, *i.e.*, the flavour developed during the course of fermentation of the juice, which is independent of the nature of the organism produc-

ing alcoholic fermentation. Thus, for instance, Foxwhelp apples yield a cider which possesses a distinctive flavour, due solely to the apple, yet if one may rely on the evidence of experienced cider-makers, unnoticeable in the apple itself or in the juice prior to fermentation. Flavour, in this sense, is probably the most important factor to be considered when estimating the value of a variety. The third factor above-mentioned, the rate of fermentation, is of very considerable importance from the practical point of view, and appears hitherto to have been neglected. It determines the nature of the cider from the point of view of sweetness or of dryness. It has been recognised for a long time that some ciders naturally remain sweet almost indefinitely, while others ferment to dryness in the course of a few weeks unless prevented by artificial means, such as the use of preservatives—a practice, generally speaking, not to be encouraged—or by filtration. The cause of such variations has been determined in the laboratory at the Institute. It does not appear to be the case that one particular variety of apple will invariably yield a juice which ferments either slowly or rapidly; but, at the same time, there seems to be some relation between the rate of fermentation and the nature of the variety, since certain kinds show a tendency, as a rule, either towards slow or rapid fermentation.

Other factors, however, in addition to that of variety, are undoubtedly of influence in determining the rate of fermentation, and it is hoped that further experiments during the coming season will reveal the effects of the soil, the season, the degree of ripeness, and other agencies in this direction. It has been commonly supposed that a comparatively large percentage of tannin is responsible for the slow fermentation in many instances, but it has been found in these experiments that the percentage of tannin bears no relation whatever to the rate of fermentation. One of the great aims of the modern cider-maker is to obtain control over the fermentation, so that he may check it at any desired point. To this end the use of the filter has been introduced, but although this causes a cessation of fermentation for a time, yet in many cases the interval is very short, and the fermentation is renewed as actively as before. The reason for this rapid fermentation

having now been ascertained, one is forced, from its nature, to the conclusion that it is impossible, without the use of preservatives, to produce from juices of this nature a sweet or moderately sweet cider which will keep well. Hence it is advisable for cider-makers who wish to produce sweet ciders to examine the properties of the apples in this direction, and to refrain from the use of such as yield juices bearing this character. Unavoidable trouble with the fermentation is certain to arise if they are used. In a similar manner, if a dry cider is required, less trouble will

THE LABORATORY.

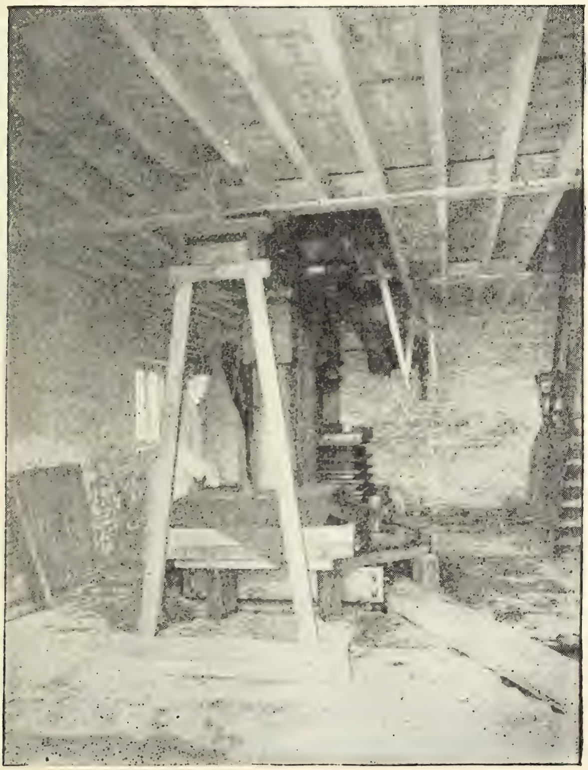
be entailed if apples of the opposite character are not used. In this case, however, it is not so serious a matter, since the difficulty of slow fermentation can be overcome by special treatment.

In addition to the knowledge of the characters of single-variety ciders, a considerable amount of information on the subject of blending has been obtained. It is the rule in cider-making to mix apples of different varieties in the desired proportions at the time of grinding; and later, when the cider is in a fit condition to drink, any deficiencies in the character

of the blend are rectified by the admixture of another cider. While it is the simplest method for the maker, when applied to experimental purposes it is unsatisfactory, since one frequently cannot determine to which constituent a given result is due. Therefore the method adopted at the Institute was to make single-variety ciders first, and then to blend them in the required manner; by so doing it was possible in many instances to trace the responsibility for certain features of the blends to a definite component and also to gain some insight into the science of blend construction. Stated in its simplest form, the object of blending is to produce a cider of superior flavour to that of an unblended or single-variety cider. The reason or necessity for blending is that single-variety ciders rarely are palatable, owing to some characters of flavour being too pronounced and others not sufficiently so. Bearing in mind the full meaning of the term flavour as pointed out above, one perceives that the first consideration should be the chemical composition of the blend. A high percentage of acids or tannins will cause the blend to be too sharp or too bitter respectively, while low percentage of these substances cause the cider to lack too greatly those qualities. A hard-and-fast limit of composition cannot be fixed, since individual taste varies considerably, but it is an easy matter for any person to fix his own standard, while it is also possible to determine extreme limits above or below which, as the case may be, it is unsatisfactory to go. This is, however, only the first step towards a good blend. The more delicate points of flavour have to be considered. It is frequently possible to make from two ciders a blend which contains the desired amounts of acids and tannins and is, nevertheless, unpalatable. Such results are due to the fact that the individual flavours of the mixed ciders do not combine well. Thus to blend to a given standard of chemical composition is not sufficient to ensure a good result. Another equally important point is one which concerns the rate of fermentation. If it is a question of blending two mature, or nearly mature, ciders, a selection should be made, so that ciders which have fermented at strikingly different rates may not be mixed together. The want of this precaution is responsible for the renewed or "secondary" fermentations

which frequently set in after blending and cause a great deal of trouble and loss. Or, if blending is done at the time of grinding of the apples and it is desired to make a cider which will remain sweet for a long time, the mixture should consist only of apples which yield slowly-fermenting juices.

Another feature which has been noticed with the ciders generally is the want of agreement as to the period at which



THE MILL HOUSE.

they attain the maximum degree of quality, some of those made last season still showing improvement in quality as they increase in age, whilst others have passed their best stage and are deteriorating with keeping. It is understood, of course, that reference is made in this statement to perfectly sound ciders only, deterioration owing to unsoundness being quite another matter. The main reason for this difference of behaviour seems to be that some ciders, from the nature of their flavour, improve as

the sweetness due to the sugar disappears in the course of fermentation, while others for the same reason increasingly deteriorate as the extent of sweetness is reduced below a certain point. Thus the former class is suitable for the production of a dry cider, and the latter of a sweet cider only.

It will be observed that a study of these facts makes it clear that cider is not a product of uniform character and behaviour, and that, in reality, under that name are included many distinct types. It follows that what is the right method of treatment for one type is not necessarily that most suited for other types. It is, therefore, a matter of importance for each individual cider-maker to make himself acquainted with the characters of the fruit which he uses, to divide it according to the types of cider it is most fitted to produce, and then to adopt the best methods of treatment for the production of those types. The number of different varieties of apples used for cider-making is so great, and the conditions under which they are grown so diverse, that it is impossible in the experimental work at a central Institute to investigate each in detail or to do more than to endeavour to elucidate general principles.

Side by side with the experimental work on a practical scale at the Institute, investigations on various problems are proceeding in the laboratory. Among the lines of work receiving special attention is the influence of the different organisms of fermentation on the nature of the cider. It has for some time been recognised that special kinds or varieties of yeasts give special characters of flavour to the liquid which they ferment. Over one hundred different kinds of yeasts have been isolated from ciders made in different districts. They have been cultivated separately and their qualities studied. Thirty of the most promising forms were selected for experiments with ciders. These were added to thirty lots of juice of the same kind, taken as it ran fresh from the press in the cider house, in quantities sufficient to dominate the character of the subsequent fermentation, one kind only of yeast to each lot of juice. At the proper period each lot of cider was bottled off and allowed to mature. Later the bottled samples were examined, when it was found that each sort possessed distinctive characters of its own, in addition to the flavour common to all and due to the kind of

apple from which the cider was made. Since all had undergone the same kind of treatment and were made from the same juice, the variations in flavour must be attributed to the kind of yeast added. It is proposed to select those which gave the best results and to test them similarly on a practical scale next season, after which it is hoped to supply the best sorts to cider-makers, so that they can control the fermentations of their ciders by their use and check the action of inferior varieties.

Certain disorders to which ciders are liable are also being investigated. Two kinds are of frequent occurrence, viz., blackening and sickness.

Cider suffering from the former malady, while retaining its normal colour in bottle or in cask, rapidly turns to a greenish-black tint after it is poured into a jug or tumbler. It is due to the oxidation of certain substances in the liquid by contact with air. The remedy generally adopted is to blend such ciders with more acid sorts, a higher degree of acidity retarding or altogether inhibiting the oxidation.

Sick cider is characterised by the production of a peculiar flavour and odour, somewhat resembling that of garlic, accompanied generally by a vigorous "secondary" fermentation. The cider frequently acquires a flavour so disagreeable that it is rendered undrinkable. It appears to be caused by the development of certain organisms which produce from some of the complex organic substances in the cider other substances possessing the disagreeable bitter flavour and aroma. The work is not yet sufficiently far advanced to allow of any statement as to treatment.

At the request of the Board of Agriculture the Institute supplies information relating to diseases of fruit and fruit trees, and the methods of combating the same.

Having thus briefly sketched the nature of some of the experimental work which is being carried on, the efforts which the Institute is making on the educational side may be noted.

Arrangements have been made by which pupils can be taken for instruction and training in practical cider-making, or for a course of instruction in the laboratory on the scientific side of cider-making, including analytical work and methods of yeast culture, or for a training in fruit-growing in the outdoor department. If desired, general instruction in each branch can be obtained.

Educational exhibits, illustrating the experimental work on cider, have been sent to several of the Shows of Agricultural Societies of the West of England. In this manner it is possible to enlist the interest of many who would not otherwise be brought into contact with the work.

The Institute is always open for inspection by visitors, and many farmers and others interested in cider-making and fruit-growing have availed themselves of the opportunity of seeing the work which is being carried on. At the same time an opportunity is thus afforded for consultations with those conducting the work on any matters of interest or difficulty, and similar information is constantly being given by correspondence to those unable to pay a visit. Applications are frequently made by cider-makers regarding the quality of their ciders or fruit. Members have therefore been given the opportunity of sending annually a certain number of ciders or varieties of apples for analysis free of charge.

A general tasting day is also arranged, on which members and others interested are invited to the Institute to sample the ciders made during the past season, an account being given at the same time of the nature of the experiments.

The first annual report has been already published and distributed throughout the counties interested. It contains an account of the work which has been done already, in addition to other matter relating to the Institute. It is proposed to supplement it by the issue at intervals of leaflets or small pamphlets containing the results of experiments and other information likely to be of interest and importance.

In another direction an effort has been made to be of some assistance to the local farmers. For a small charge they can take their fruit to the Institute to be ground and pressed, thus saving themselves a considerable amount of labour and trouble, and at the same time obtaining the juice under conditions of strict cleanliness and, as far as possible, with all danger of contamination removed.

No mention of the experimental work which is being carried on in the fruit-growing department will be made here. It is hoped that another article dealing specially with this branch will follow shortly. B. T. P. BARKER.

AGRICULTURAL RETURNS OF 1905.

The preliminary statement of the acreage and live stock returns, issued by the Board on the 25th ult., shews that the total acreage under crops and grass in Great Britain amounted to 32,286,832 acres in 1905, this figure representing a decline of 30,778 acres from the area so returned in 1904. The changes in the extent of arable and pasture land respectively, and in the chief categories of crops, may be summarised as follows:—

Crops.	1905.	1904.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Cereal Crops	7,054,222	6,953,034	+ 101,188	+ 1·5
Other Crops	3,205,283	3,162,335	+ 42,948	+ 1·4
Clover and Rotation Grass...	4,477,520	4,671,495	− 193,975	− 4·2
Bare Fallow	349,313	432,690	− 83,377	− 19·3
Total Arable	15,086,338	15,219,554	− 133,216	− 0·9
Permanent Pasture	17,200,494	17,098,056	+ 102,438	+ 0·6
Total	32,286,832	32,317,610	− 30,778	− 0·1

There is thus a recovery of over 100,000 acres in the area under cereal crops, bringing this surface back to within a few thousand acres of the total returned in 1903. Other crops—excluding clover and rotation grasses—have also increased, and, relatively, in the same proportion as cereals. The clover and rotation grasses, on the other hand, shew a considerable fall, amounting to nearly 200,000 acres, or over 4 per cent.; and the area of the bare fallow exhibits a satisfactory decline of nearly 20 per cent. The decrease in the arable land of Great Britain amounts, on the whole, to 133,000 acres, or a little less than 1 per cent., of which rather more than 100,000 acres are accounted for by the further extension of permanent pasture.

The main feature in the returns of cereal crops in 1905 is, undoubtedly, the increase in the area devoted to wheat. Last year a heavy decline in this cereal was noted, and was attributed in large part to the very wet and unfavourable autumn of 1903. In the present season, owing mainly to an unusually favourable autumn, not only have the 200,000 acres then lost to this crop been recovered, but an addition of a similar amount has been made, the increase over last year thus amounting to

no less than 421,701 acres, or over 30 per cent., and bringing the acreage up to a greater total than in any year since 1900. Consequent, to some extent at least, upon the restoration of so large a breadth of land to wheat, the two other principal corn crops—barley and oats—shew a large decline, amounting in each case to between 6 and 7 per cent. The barley acreage is much the lowest ever returned, while that of oats, which had, as frequently noticed on previous occasions, been, on the whole, increasing for several years past, has gone back to about the level of 1902. The detailed figures regarding these crops are as follows :—

Crop.	1905.	1904.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Wheat	1,796,985	1,375,284	+421,701	+ 30·7
Barley	1,713.664	1,840,684	– 127,020	– 6·9
Oats	3,051,376	3,252,962	– 201.586	– 6·2
Rye	62,197	55,714	+ 6 483	+ 11·6
Beans	254,765	252,782	+ 1,983	+ 0·8
Peas...	175,235	175,608	– 373	– 0·2

Among other crops nearly 40,000 acres have been added to the acreage of potatoes, making this the first occasion since 1871, when some 628,000 acres were returned, that over 600,000 acres have been returned as under this crop in Great Britain. The decline of nearly 15,000 acres in turnips and swedes is, relatively to the total acreage under this crop, small, but it is sufficient to reduce the aggregate below 1,600,000 acres for the first time on record. Mangolds exhibit a small increase, and once more exceed 400,000 acres.

Hops show the first increase in area for the past six years. The green and other crops may be summarised as follows :—

Crop.	1905.	1904.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Potatoes	608,471	570,209	+38,262	+6·7
Turnips and Swedes ...	1,589,273	1,604,104	– 14,831	–0·9
Mangold	404,123	398,827	+ 5,296	+ 1·3
Cabbage and Kohlrabi ...	85,345	80,214	+ 5,131	+6·4
Rape	93,881	97,772	– 3,891	–4·0
Vetches or Tares	136,429	128,229	+ 8,200	+6·4
Lucerne	53,410	55,724	– 2,314	–4·2
Hops	48,968	47,799	+ 1,169	+2·4
Small Fruit	78,822	77,947	+ 875	+1·1
Other Crops	106,561	101,510	+ 5,051	+5·0

The area intended for hay—whether from rotation or permanent grass—shows a decline, which is most pronounced in the acreage of clover and rotation grasses. Of the area not intended for hay, that under rotation grass shows a decline, which is more than counterbalanced by an increase in the area of permanent grass reserved for grazing. The details are as follows :—

Crop.	1905.	1904.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Clover and Rotation Grass (for hay)	2,189,288	2,322,895	– 133,607	– 5·8
Ditto (not for hay)	2,288,232	2,348,600	– 60,368	– 2·6
Total	4,477,520	4,671,495	– 193,975	– 4·2
Permanent Grass (for hay)	4,688,520	4,765,403	– 76,883	– 1·6
Ditto (not for hay)... ...	12,511,974	12,332,653	+ 179,321	+ 1·5
Total	17,200,494	17,098,056	+ 102,438	+ 0·6

In live stock, increases have to be noted in agricultural horses, cattle, and sheep, and a decrease in swine. From the subjoined table it will be seen that while all classes of horses have increased, the augmentation was most considerable among unbroken horses over one year old :—

Horses.	1905.	1904.	Increase or Decrease.	
	Number.	Number.	Number.	Per Cent.
Horses used for Agricultural Purposes	1,122,419	1,120,247	+ 2,172	+ 0·2
Unbroken Horses (one year and above)	310,333	301,371	+ 8,962	+ 3·0
Ditto (under one year) ...	139,681	138,618	+ 1,063	+ 0·8
Total	1,572,433	1,560,236	+ 12,197	+ 0·8

The increase in the number of cattle, amounting to nearly 2 per cent., is sufficient to bring the total to some 40,000 above the highest hitherto recorded, viz., 6,944,000, in 1892. The increase is proportionately greatest in cattle of more than one year old, other than cows and heifers; the latter have, however, increased by 1 per cent., and again exceed any previous returns. The actual numbers are as follows :—

Cattle.	1905.	1904.	Increase or Decrease.	
	Number.	Number.	Number.	Per Cent.
Cows and Heifers in Milk or in Calf	2,707,392	2,678,680	+ 28,712	+ 1·1
Other Cattle (two years and above)	1,415,317	1,374,636	+ 40,681	+ 3·0
Ditto (one year and under two)	1,471,070	1,429,833	+ 41,237	+ 2·9
Ditto (under one year) ...	1,393,241	1,375,203	+ 18,038	+ 1·3
Total	6,987,020	6,858,352	+ 128,668	+ 1·9

The total of sheep, for the first time since 1899, shews a slight rise, and the number now is practically the same as in 1888. The increase is greatest in sheep (other than breeding ewes) under one year, but this is more than set off by the reduction in the older sheep, the most satisfactory point to be noted being the increase of ewes.

Sheep.	1905.	1904.	Increase or Decrease.	
	Number.	Number.	Number.	Per Cent.
Ewes kept for Breeding ...	9,935,766	9,880,908	+ 54,858	+ 0·6
Other Sheep (one year and above)	5,147,517	5,313,602	– 166,085	– 3·1
Ditto (under one year) ...	10,173,913	10,012,668	+ 161,245	+ 1·6
Total	25,257,196	25,207,178	+ 50,018	+ 0·2

Swine, always a very variable number, shew a large decline, viz., from 2,861,644 to 2,424,919 or 15·3 per cent. The total has, however, frequently been lower, *e.g.*, so recently as 1902, and it is about equal to the average of the past thirty years. Of the above total, sows kept for breeding numbered 335,008, as compared with 382,056 in 1904, a decrease of 12·3 per cent.

Corresponding details relating to Ireland have been published by the Department of Agriculture and Technical Instruction for Ireland, and the summary on p. 339 is given for comparison :—

As in Great Britain, a larger area has been placed under wheat, although the increase is not so striking, while oats and barley have fallen away. Taking all cereal crops together, there is a decline in Ireland of 8,039 acres. Green and other crops also shew a decrease, as a whole of 4,230 acres. The potato area

Crop.	1905.	1904.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Wheat...	38,039	30,825	+ 7,214	+23·4
Barley and Bere	154,642	158,103	− 3,461	− 2·2
Oats	1,066,592	1,078,772	−12,180	− 1·1
Rye	10,152	9,414	+ 738	+ 7·8
Beans and Peas	1,725	2,075	− 350	−16·9
Potatoes	616,623	618,540	− 1,917	− 0·3
Turnips	282,217	285,831	− 3,614	− 1·3
Mangold and Beetroot ...	72,747	75,828	− 3,081	− 4·1
Carrots and Parsnips... ...	2,378	2,727	− 349	−12·8
Cabbage	42,679	39,665	+ 3,014	+ 7·6
Vetches	2,587	2,761	− 174	− 6·3
Rape	2,999	3,481	− 482	−13·9
Other Green Crops	22,163	21,650	+ 513	+ 2·4
Flax	46,153	44,293	+ 1,860	+ 4·2
Clover and Rotation Grasses — For Hay ...	628,618	631,748	− 3,130	− 0·5
Clover and Rotation Grasses — Not for Hay	626,474	647,416	−20,942	− 3·2
Permanent Grass — For Hay ...	1,665,956	1,628,412	+37,544	+ 2·3
Permanent Grass — Not for Hay ...	9,971,374	9,939,223	+32,151	+ 0·3
Bare Fallow	8,903	9,360	− 457	− 4·9

diminished, as did also that under turnips and mangold, while there were increases in the acreage of carrots and flax. Clover and rotation grasses, as in Great Britain, exhibit a decline while permanent pasture, whether for hay or not, exhibited an increase of 69,695 acres. Bare fallow also fell off, and thus all the main categories of arable area showed a decrease, amounting in all to 36,796 acres, as compared with 1904.

Among Irish live stock an increase of horses is to be noted, but cattle, sheep, and swine all declined. Only in one class of cattle, viz., "other cattle of two years and upwards," was there any increase. The totals are as follows :—

Live Stock.	1905.	1904.	Increase or Decrease.	
	Number.	Number.	Number.	Per Cent.
Horses	608,992	604,930	+ 4,062	+ 0·7
Cattle :—Milch Cows ...	1,487,065	1,497,647	− 10,582	− 0·7
Other Cattle ...	3,158,157	3,179,071	− 20,914	− 0·7
Total Cattle ...	4,645,222	4,676,718	− 31,496	− 0·7
Sheep	3,749,313	3,827,919	− 78,606	− 2·1
Swine	1,164,322	1,315,126	− 150,804	− 11·4

CONFERENCES ON RAILWAY RATES.

The Board have addressed the following circular to Agricultural Societies, Chambers of Agriculture, and Farmers' Clubs in Great Britain :—

Board of Agriculture and Fisheries,
4, Whitehall Place, London, S.W.,
August, 1905.

SIR,—I am directed by the President of the Board of Agriculture and Fisheries to inform you that he has again had under his consideration the question of the rates and facilities for the carriage of agricultural produce, as to which correspondence took place last year between the Board and the principal Railway Companies (Parliamentary Paper Cd. 2045).*

One of the subjects discussed in that correspondence was the desirability of holding from time to time local conferences between agriculturists and representatives of the Railway Companies, and, with a view to facilitate the holding of such conferences, Mr. Fellowes has recently addressed the following letter to the Chairmen and General Managers of the principal Railway Companies.

"Board of Agriculture and Fisheries,
"4, Whitehall Place, London, S.W.,
"July 7th, 1905.

"SIR,—You will remember that in the correspondence which took place last year between this Department and the Railway Companies on the subject of the rates and facilities for the carriage of agricultural produce, and which was published as a Parliamentary Paper [Cd. 2045], reference was made to the advantage that might be obtained if local conferences were held from time to time at which representatives of the Railway Companies might attend to discuss with agriculturists any questions which presented themselves for settlement.

"Two such conferences have since been held at the instigation of the Board, and my attention has recently been called to another conference which was held between the Goods Manager of one of the large Railway Companies and the members of an important Chamber of Agriculture.

"The result of this Conference was more successful than I could possibly have hoped, for not only were agriculturists able to discuss the various matters in which they are interested with a chief official of the Railway Companies, but many misconceptions on the part of the farmers were removed by the explanations which the Goods Manager was able to give.

"It is undoubtedly the case that there is often in the minds of many farmers a feeling of irritation against the Railway Companies, which is largely due to the fact that they do not realise or understand the conditions under which the goods traffic of a railway is carried on, and I believe that very much good would result if from time to time conferences were held in different parts of the country between the local agriculturists and one of the chief officers of the Railway Company.

* See *Journal*, Vol. XI., No. 2, p. 65, and No. 9 p. 513.

"In addition to removing friction and disseminating knowledge, such conferences would give a powerful stimulus to the movement towards co-operation, by bringing under the notice of agriculturists concrete instances of the advantage of aggregating their consignments, and generally in the making of combined arrangements for the distribution of their produce.

"I hope therefore that you will favourably consider my suggestion that such conferences should be held at different agricultural centres in your system with one of the chief officers of your Company. I should always be glad, if desired, to arrange for the attendance for one of our Inspectors, and to do all in my power to promote friendly relations between agriculturists and the Railway Companies.

"Yours faithfully,

(*Signed*) "AILWYN E. FELLOWES."

P.S.—We would of course invite agriculturists to attend any conferences which might be thus arranged.

The replies which Mr. Fellowes has received from the Chairmen and General Managers are of a very cordial character, and there is complete unanimity among them in expressing their willingness to take part in conferences of the description proposed whenever they may be thought desirable.

Mr. Fellowes desires to bring these circumstances under your notice, and to suggest for your consideration that if any of your members are experiencing difficulty in disposing of agricultural produce owing to delay in transit or heavy cost of carriage, or if any of them are adversely affected by an inequality or anomaly in rates, or by the insufficiency of facilities at their disposal for the carriage of agricultural produce by rail, you should communicate with the Board, giving particulars of the difficulties or anomalies in question, with a view to the holding of a conference between some of your members, and representatives of the Railway Companies, and one of the Inspectors of the Board.

I am, Sir, your obedient servant,

T. H. ELLIOTT,

Secretary.

AGRICULTURAL IMPORTS OF THE CEREAL YEAR.

The close of the period known as the cereal year (1st September to 31st August) affords an opportunity of considering the extent to which during the past twelve months this country has relied on foreign supplies of grain to supplement the home harvest of 1904.

Taking, in the first place, wheat, which forms in point of value the largest single item of any of our agricultural imports, the past twelve months have seen further evidence of that expansion in the receipts of wheat grain which has now been so marked a feature of the corn trade for some years past. Reference to the table on the next page will show that for the five years 1895–96 to 1899–1900 the imports were fairly steady at about 66 million cwt., while since then they have shown a rapid growth, which has brought them up to a total of 105,125,000 cwt. in 1904–1905, an increase of over 60 per cent. in five years. Wheat-flour, on the other hand, has not exhibited any permanent signs of growth during the decade shown in the table, and in the past year the imports were only 10,882,000 cwt., compared with a ten years' average of 20,380,000.

Taking the wheat grain and flour together, and expressing the flour in its approximate weight as grain, the imports in 1904–5 represent 28,056,000 qrs. (of 480 lb.) of wheat, compared with 27,927,000 qrs. in 1903–4. The estimated quantity of this grain obtained in the United Kingdom from the harvest of 1904 was 4,740,000 qrs., so that the foreign grain represented no less than 85·5 per cent. of the gross supply available for all purposes in these islands.

With regard to the countries contributing to the supply, the receipts from each of the principal sources are given in the following table :—

—	In Thousands of Cwt.			
	1904–5.	1903–4.	1902–3.	1901–2.
India	29,083	23,144	11,908	7,428
Russia	28,823	19,331	13,721	3,061
Argentina	24,085	17,490	11,856	4,973
United States	4,558	12,897	32,035	41,584
Canada	3,547	8,355	11,471	8,302
Australia	12,758	6,322	79	6,048

The United States, which fell last year from the position it had for many years occupied as the principal exporter of wheat to this country, again sent a very small quantity of wheat while India, Russia, and Argentina maintained approximately the relative positions they took up last year. The imports

from Canada showed a decline, and were relatively unimportant, whilst those of Australia put the Commonwealth fourth on the scale of contributing countries.

The decline in the imports of wheat-flour was due to diminished receipts both from the United States and Canada.

In the case of barley the very high figure reached in 1903–4 was not maintained, while a falling off is noticeable in maize, which brings the imports to a lower figure than for many years past with the exception of 1902-3. This diminution is chiefly due to the prohibition of the export of this grain from Roumania in consequence of the severe drought and poor harvest in 1904. There was also a diminished export from Russia, while the United States and Canada increased their supplies.

The figures for the principal cereals in each of the past ten harvest years are given below :—

Year.	In Millions of Cwt.				
	Wheat.	Wheat-flour.	Barley.	Oats.	Maize.
1904–1905	105·1	10.9	21·0	17·2	42·3
1903–1904	93·1	19·1	31·9	15·2	47·6
1902–1903	85·1	19·2	25·7	16·6	41·6
1901–1902	74·7	19·1	23·1	16·7	47·2
1900–1901	71·2	23·3	18·7	22·1	55·8
1899–1900	65·0	21·6	15·2	19·8	57·7
1898–1899	67·0	22·9	22·9	14·9	57·5
1897–1898	66·4	20·0	20·3	15·4	55·6
1896–1897	65·0	20·0	21·7	18·4	59·7
1895–1896	68·8	19·9	22·0	15·1	44·5

The table which is given on the next page shows the imports in the twelve months under review of the other principal agricultural commodities. The receipts of beef, including the estimated weight represented by the arrivals of live cattle, amounted to 8,471,000 cwt., as compared with 7,967,000 cwt., received in 1903–4. Live sheep were received in fewer numbers, and the aggregate imports of fresh mutton, both dead and on the hoof, amounted to 3,822,000 cwt., compared with 3,864,000 cwt. in the preceding year.

The total imports of bacon were rather larger, but while the receipts from Canada (1,112,000 cwt.) increased, there was a

falling off in the exports from the United States (2,819,000 cwt.), and from Denmark (1,575,000 cwt.).

For the first time for several years a check has been experienced in the consignments of butter from abroad, the total in the past year falling to 4,106,000 cwt. from the maximum of 4,361,000 cwt. which it reached in 1903-4. Towards this total

Articles.		1st Sept., 1904, to 31st Aug., 1905.		1st Sept., 1903, to 31st Aug., 1904.	
		Quantities.	Values.	Quantities.	Values.
			£		£
Horses	No.	12,813	350,276	20,512	489,801
Cattle	,,	549,347	9,451,396	547,626	9,668,301
Sheep and Lambs	,,	292,565	443,427	369,313	572,017
Bacon	cwt.	5,599,131	12,962,202	5,374,627	12,963,926
Hams	,,	1,332,706	3,177,261	1,223,796	3,145,896
Beef:					
Salted	,,	144,651	199,440	150,211	192,510
Fresh	,,	4,895,299	8,618,313	4,220,269	8,089,391
Mutton, fresh ...	,,	3,661,813	7,166,544	3,589,095	6,996,404
Pork:					
Salted (not Hams)	,,	232,067	281,757	243,320	299,974
Fresh	,,	555,351	1,274,223	660,940	1,461,176
Meat unenumerated:					
Salted or fresh	,,	665,819	1,214,213	637,750	1,175,193
Preserved otherwise than by salting ...	,,	775,224	2,470,704	849,819	2,633,342
Rabbits	,,	647,863	860,451	418,954	672,412
Corn:					
Wheat	,,	105,125,030	37,846,288	93,102,100	31,914,863
Wheat Meal and Flour ...	,,	10,882,143	5,478,331	19,141,758	9,289,275
Barley	,,	29,002,400	5,692,495	31,859,530	8,437,468
Oats	,,	17,211,000	4,714,450	15,188,900	3,953,695
Maize	,,	42,276,850	10,666,987	47,637,340	11,282,702
Butter	,,	4,105,799	21,065,270	4,360,784	21,642,360
Margarine ...	,,	1,058,609	2,721,585	915,488	2,387,240
Cheese	,,	2,492,036	6,016,248	2,585,882	6,267,049
Milk, condensed	,,	885,635	1,572,385	897,357	1,627,036
,, and cream, fresh and preserved	,,	7.185	22,056	13,729	32,516
Eggs ...	gt. hundreds	19,268,205	6,784,070	19,926,229	6,676,226
Fruit:					
Apples... ...	cwt.	3,566,462	1,838,884	4,913,028	3,014,418
Pears	,,	443,688	416,560	451,398	485,068
Hops	,,	243,731	1,574,638	159,671	741,966
Onions ...	bushels	7,451,784	1,124,948	8,644,669	1,040,807
Potatoes	cwt.	4,129,785	1,478,589	13,482,112	3,107,041
Tomatoes ...	,,	1,136,976	990,382	1,129,314	1,014,171
Tallow and Stearine	,,	1,743,329	2,220,331	1,744,664	2,276,843
Wool	lb.	599,034,477	22,794,116	543,718,866	19,399,844
Hides, wet and dry	cwt.	821,047	2,256,512	774,874	2,040,392
Lard	,,	1,945,388	3,534,364	6,743,676	3,210,417
Poultry and Game		—	1,077,295	—	1,835,929
Vegetables (unenumerated) ...		—	447,234	—	455,478

Denmark contributed about one-fourth, while of the other Continental countries Russia, France, Sweden, and Holland were important sources of supply, while Colonial butter from New Zealand, Australia, and Canada amounted in the aggregate to 1,087,825 cwt., or 26·5 per cent. of the total supply.

Estimates of Future Wheat Production in Canada.

A Report on the North-West of Canada, with special reference to wheat production, has been prepared for the Board of Trade by Professor Mavor, of the University of Toronto. The object of the inquiry was to throw light on the existing conditions and future prospects of wheat growing in the North-West of Canada for export to the United Kingdom. The region to which the Report refers comprises Manitoba and the territories of Assiniboia, Saskatchewan and Alberta, having a total area of 229 million acres (excluding the area of water).

The Report gives much interesting information respecting the geology, physical geography and climatology of the region, and its settlement, together with the history, present conditions and prospects of agriculture, and includes a discussion of certain estimates of the possible area of wheat growing and of the possible production and export of wheat in the future.

The cultivation of wheat depends upon so great a variety of conditions that any estimate of the area physically or economically susceptible of being utilised for wheat production must be more or less speculative, and Professor Mavor makes it clear that even the most careful estimates must be received with the greatest caution, but he puts forward two calculations made by persons of authority and experience, as well as one taken from a pamphlet on "Wheat Growing in Canada," by Dr. Saunders, the Director of Experimental Farms.

In the first of these estimates it is calculated that out of a total area of 153 million acres some 92 million acres are susceptible of settlement or cultivation, of which 23 millions would be annually available for crop production, and of this $13\frac{3}{4}$ millions would be available for wheat production. Assuming

an average yield of $18\frac{1}{2}$ bushels per acre, this would give 254 million bushels, of which 169 million bushels might be available for export.

In the second estimate, the area suitable for settlement is put at 101 million acres and the possible area annually available for wheat growing at 22,432,000 acres. Estimating the yield at 15·9 bushels per acre, this would produce 357 million bushels.

Dr. Saunders takes a much more sanguine view of the wheat-producing capacity of the semi-arid area, and puts the surface available for wheat at $42\frac{3}{4}$ million acres, which at 19 bushels per acre would give 812 million bushels.

Should the quantity of wheat realised be no more than the quantity available according to estimate No. 1, it does not appear on that basis that the quantity of wheat available from the Canadian wheat-fields would be sufficient to supply the present requirements of the British market, which are about 220 million bushels. It may be urged, however, either that the productive capacities of the wheat areas under consideration have been under-estimated, or that more distant areas which may also turn out to be wheat producing have been omitted. It may also be urged with more force that an advance in the price of wheat might bring into cultivation some land which has been left out of account in the estimate.

The authors of the several estimates are well qualified to judge, and all that can be said is that the two first err, perhaps, on the side of too great caution, while the third errs, perhaps, in being over sanguine.

An important factor is the question of population. In 1891 the total population of the North-West was 219,000 persons and in 1901 it was 414,000 persons. Of this total the rural population was 305,000, of which 184,000 were in Manitoba and 121,000 in the Territories, and it is to be noted that the yield from their labour in 1901 was 63 million bushels. Professor Mavor thinks, therefore, that under the most favourable circumstances which it is justifiable to consider, the population of the North-West would require to increase to about five times its present amount before it would be safe to infer that the North-West could be relied upon to provide a quantity of wheat nearly sufficient for the requirements of Great Britain, assuming the

amount of these requirements to remain stationary and assuming that Canada did not export to other countries.

It may be of interest to add the figures of the area under wheat cultivation and the produce in recent years. The area under wheat in 1891 was 896,622 acres in Manitoba and 113,811 acres in the North-West Territories.

Year.	Manitoba.		N.-W. Territories.		Total.	
	Area.	Produce.	Area.	Produce.	Area.	Produce.
	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.
1891	896,622	—	113,811	—	1,010,433	—
1901	2,011,835	50,502,035	504,697	12,808,447	2,516,532	63,310,482
1902	2,039,940	53,077,267	625,758	13,956,850	2,665,698	67,034,117
1903	2,442,873	40,116,878	840,703	16,111,569	3,283,547	56,228,447
1904	2,412,235	39,162,458	1,055,282	20,446,000	3,467,517	59,608,458

From this it will be seen that the area under cultivation in 1904 was under $3\frac{1}{2}$ million acres with a production of 60 million bushels, equal to an average yield of $17\frac{1}{5}$ bushels per acre. The mean yield per acre in Manitoba, 1891-1902, was $18\frac{1}{2}$ bushels per acre, while the mean yield of the North-West Territories in the seven years 1898 to 1904 for which particulars are available was rather over 18 bushels.

Blindness in Barley and Oats.

Several cases of a disease known as "blindness" in barley, or barley "stripe," having recently been brought to the notice of the Board, the Director of the Royal Botanic Gardens, Kew, has prepared the following memorandum on the subject:—

Fifty years ago, Rabenhorst, a German botanist, issued specimens of a minute fungus under the name of *Helminthosporium gramineum*, parasitic on the leaves of cultivated barley in Germany. It was noted that leaves attacked by the fungus died during the flowering period.

The fungus has subsequently been recorded from other European countries as a parasite on barley, but it does not appear in any instance to have assumed the proportions of an extended epidemic, but has been local and sporadic in its occurrence. During recent years the disease has been observed in this country, where it appears to be on the increase.

The symptoms of its presence are as follows:—The young leaves and leaf-sheaths are at first marked with minute, scattered, pale green spots; these spots increase in number and size, and the leaf gradually changes to a sickly yellow-green colour, after which it droops and ceases to grow. Finally the spots become darker in colour, and have an olive green tinge. In

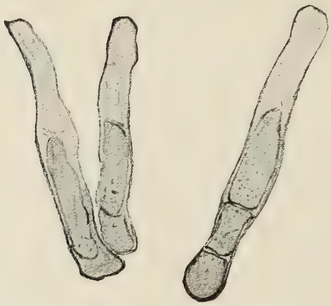


Fig. 1.—Hyphæ of Barley "Stripe" fungus: *Helminthosporium gramineum*, Rabh. (x 550.)

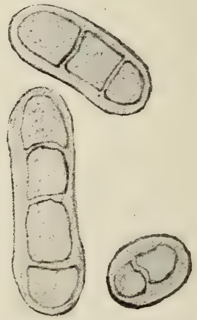


Fig. 2.—Spores of Barley "Stripe" fungus. (x 550.)

some instances, when the fungus is very abundant, the leaf-sheaths and leaves are of a uniform brownish-olive colour. The stunting of the plant is in proportion to the severity of the attack, but in almost all instances the plant is practically killed before the ear is liberated from the leaf-sheath enclosing it, hence the disease is known as "blindness."

The fungus has been observed this season on the leaves of wild barley (*Hordeum murinum*) in the neighbourhood of Kew.

Ravn, a Danish botanist, has recently studied the disease, and has also shown that oats are subject to an exactly similar disease, caused by a fungus very closely allied to the barley *Helminthosporium*.

The fungus is difficult to eradicate; two different kinds of spores are produced, and these on germination are capable of growing on decaying vegetable matter, and thus keep themselves going on the land until a crop of barley is again sown.

In addition, minute sclerotia or condensed masses of mycelium are formed in the leaves, and these bodies retain their vitality for a considerable period of time, and are not likely to be injured by passing through the intestines of an animal, and may thus be returned to the land with manure.

It is highly probable that these fungi grow on several kinds of wild grass, and from thence may pass to cultivated oats and barley. This suggests the clearing away of all grasses from headlands and hedge banks.

The ear is not usually attacked, as it rarely escapes from the leaf-sheath, and there is no germ of the fungus in the grain, although spores of the fungus may adhere to the grain and thus be transported from place to place along with the latter. If the grain is sprinkled with 1 per cent. of formalin in water, and thoroughly mixed so that all the grain comes in contact with the solution, spores of *Helminthosporium* and of "smut" will be destroyed.

The Board have also been furnished with the following note on the same subject by Professor Percival, of University College, Reading :—

Since 1897 attention has been drawn to a diease of the barley crop which is becoming more prevalent every year in this country.

The plants which are attacked are very much checked in their growth, barely reaching more than about half their normal height. In bad cases the crop dries up without producing more than a small percentage of well developed ears.

The ears of some plants never escape from the leaf sheath at all, while others make the attempt but are not able to do so completely, the tip of the ear remaining entangled in the sheath. Even when the ears grow out, many of them die prematurely, and remain erect instead of becoming "sickled" as in the healthy, well ripened crop. The brown, dead upstanding ears present an abnormal appearance which farmers at once recognise as something wrong.

In the earliest stages of the disease yellow elongated stripes or patches are met with on the leaves. Later, the stripes increase in size and number, turning thin and pale, and presently become margined by a characteristic reddish-brown rim. The plants finally die, the leaf blades often becoming slit into shreds. So far as the observations made up to the present go, about 20 per cent. of the crop, in bad cases, produces no grain, and the disease does not appear to spread among the rest of the crop, though seed saved from it, without a doubt, gives rise to diseased plants in the following year, just as is the case with smut and bunt.

The trouble is due to a small fungus—*Helminthosporium gramineum*, Roth.

On the dying patches of the leaves it can readily be observed with the microscope, the short pale hypha projecting above the surface. Later the hyphæ become dark brown. These bear septate spores. There is abundant evidence that the disease is transmitted by seed.

The first acquaintance of the writer with it was made about eight years ago in experimental cultures of foreign samples of barley. Last year a case was brought to my notice by the Board of Agriculture in which one half of a large field was seriously damaged by it, the other half being quite free, although the crops were growing side by side. Both barleys had received similar cultivation and other treatment.

The treatment necessary to keep the pest in check is the same as that carried out for smut, namely, pickling with copper sulphate, or better still, the hot-water method described in Leaflet No. 92. Although it is not customary to pickle or steep seed barley there is no doubt it pays to do so to check not only "stripe," but both kinds of barley smut which have become so prevalent in many districts during the last few years.

It is essential to bear in mind that barley is much more delicate than wheat, and is easily damaged by overdoses of copper sulphate. The hot water method is best, but the temperature of the water used for steeping should not be more than 126 deg. F.

Notes on Foreign Crop Prospects.

Germany.—According to the official report, the condition of the crops in Germany in mid-August is indicated by the following figures (2 = good; 3 = average):—Winter wheat, 2·5; spring wheat, 2·6; winter rye, 2·7; spring rye, 2·6; barley, 2·7; oats, 2·9; and potatoes, 2·3. The winter cereals have somewhat fallen off, the average figures for July being 2·4 for winter wheat and 2·5 for winter rye. Harvesting operations have been rendered difficult by abundant rain; rye has been laid, and even found growing in the ear; and wheat, in places, attacked by rust. This is also the case with spring cereals, which have been adversely affected by untimely storms

and heavy rains, barley having apparently suffered heavily, and oats in some cases having been especially damaged. On account of early ripening, weeds, hail, &c., both grain and corn leave much to be desired. At the time this was written little corn remained in the fields, and the report may therefore be taken as a final review of the harvest. Potatoes remain about the same on the average, the warm, moist storms having made the leafage grow well, though many bad tubers are found here and there. In many parts the long-continued drought has done considerable harm, while in many parts of Baden hail has been the cause of great damage.

Austria-Hungary.—The official report of August 20th states that not only is the winter and spring wheat harvest over, but that for the most part it has been threshed, with results which appear to be in general satisfactory, the quantitative yield being fairly good. The yields of winter rye, as shown by threshed samples, fall very little short of the estimates already given. Barley now only remains to be harvested in the high-lying districts ; in other cases threshing is already over. It has been damaged by the dry heat, the yields for winter barley being good in quality and medium in quantity, spring barley not being so good. Oats were also affected by the heat in the month of July, the result being much injured grain, which leaves much to be desired in the matter of colour.

According to an official report quoted by *Dornbusch*, the wheat crop of Hungary is now estimated at about 168,000,000 bushels, a considerable increase over a former estimate, whilst that of Austria is placed at 46,000,000 bushels. The Hungarian maize crop is estimated at 112,000,000 to 120,000,000 bushels.

According to the official report, quoted by the *Times*, the yield of hops in Upper Austria will be an average. In Bohemia the results are stated to be up to all expectations, both as regards quantity and quality, the yield being estimated at about 157,000 cwt.

Nova Scotia.—The official report states that "the general opinion from the best information obtainable is that the apple crop will fall considerably below the average."

Russia.—According to official reports the condition of the crops in Poland and Lithuania up to mid-July was stated to be

very satisfactory. Towards the end of that month, however, some damage was done to outstanding barley and wheat by frequent heavy rains, quality being chiefly affected.

The Russian *Official Messenger* of August 30th states that a failure of the autumn and spring crops in the Saratoff, Tamboff, Tula, and several other provinces is now substantiated, while unsatisfactory returns of the rye crops come from a number of other provinces. The Governments most seriously affected appear to be Saratoff, Riazan, Tula, Orel, and Tamboff, where grain stores are being organised, and about three-quarters of a million pounds sterling has had to be assigned from the general alimentary capital of the Empire in the shape of loans to the destitute population in certain provinces. The purchase and distribution of seed corn is being carried out, and hence the autumn sowing may be held to be assured.

According to the preliminary estimate of the Central Statistical Bureau, quoted by *Dornbusch*, the probable total yields of the winter and spring crops in the seventy-two Governments of the Empire are as follows:—Winter wheat, 195,000,000 bushels; spring wheat, 338,400,000 bushels; winter rye, 610,200,000 bushels; spring rye, 13,800,000 bushels; barley, 272,880,000 bushels; and maize, 46,200,000 bushels.

Norway.—The Consul-General for Christiania reports that in the district of South Trondhjem the corn crops are likely to be somewhat above the average. Wheat, barley, and rye promise good results in the district of Bratsberg, but the oat crop has failed on account of drought and insect attacks. Cereals in the western districts are well above the average, and the same may be said of hay and potatoes. Of several other districts it is stated that the cereal crops are good, both as regards grain and straw, but the oat crop is generally reported as poor.

United States.—In the summary of the September crop report, quoted by *Dornbusch*, the United States Bureau of Agriculture states that the average condition of spring wheat on September 1st was 87·3 against 89·2 on August 1st, and 66·2 on September 1st, 1904. Maize on the same date was 89·5 compared with 89 on August 1st; oats 90·3 against 90·8; and barley 87·8 against 89·5 in August. Wheat, barley and oats were already harvested.

Improvement of Mangels.

There are, perhaps, few subjects of more practical interest to the farmer than the production of new varieties of cultivated plants possessing superior cropping powers or feeding qualities. The frequent introduction of new strains of our common root crops, differing only in some minor characteristic, is evidence of the eagerness with which new varieties are sought after in the hope of obtaining a heavier crop, while the experiments which are now being conducted in regard to the improvement of wheat* by cross-breeding are an example of an attempt to influence the quality of the produce. The more common method of improvement, viz., by selection, is, briefly, to make a careful examination of the individual plants in crops cultivated in the ordinary way, and from these to select those that are distinguished above their fellows by features which it is considered desirable to perpetuate. Whatever may be the object selected, it must be kept steadily in view for a series of years, and all individuals in the progeny that fail to develop the desired characteristic must be carefully eliminated.

The essential point, however, which should be taken into account in the case of farmers' crops is that the feature selected for improvement should be one which really makes the crop of more value to the farmer, and not merely some un-unimportant and possibly external modification.

In this connection, some investigations† which have been carried out at the University of Cambridge by Mr. T. B. Wood, M.A., Reader in Agricultural Chemistry, and Mr. R. A. Berry, F.I.C., Assistant Chemist in the University Department of Agriculture, in connection with the variation in the chemical composition of mangels, are of great interest to farmers, since they suggest that, notwithstanding the numerous new strains of mangels introduced during the last half-century, it is questionable whether there has been any real improvement in that feature which alone is of importance to the farmer, viz., the feeding value.

The method adopted in carrying out the investigation was to sow annually at several stations a number of seedsmen's strains

* *Journal*, Sept. 1904, p. 321; June, 1905, p. 156.

† *The Journal of Agricultural Science*, Vol. I., Part 2.

of swedes, mangels, and turnips. These were sown on plots side by side, and treated similarly in every possible way, both culturally and manurially. In the autumn the crop of each plot was weighed, sampled, and analysed.

From a comparison of the results information was obtained as to the variation among the different strains on different soils and as to the effect of season and manuring, as well as the variation with size and individuality.

One point which soon became evident was the occurrence of very considerable variation in the chemical composition of individual roots of the same strain, even when grown side by side in the same field, so that in order to obtain a mixed sample representing the composition of the crop it was found necessary to take an average of fifty roots. The variation that occurs is shown by the fact that in 1902 in 200 individual roots of Sutton's Golden Globe four roots were found containing less than 11 per cent. of dry matter, and four roots containing over 18 per cent. Similar results were also obtained in the same year with Webb's Golden King and with Carter's 1901, and Messrs. Wood and Berry point out that a plant which varies to this extent ought to be capable of rapid improvement by careful selection.

Such an improvement, it is well known, has been brought about in the case of the sugar-beet. About fifty years ago Ventzke suggested that sugar-beet workers were selecting for shape and other external characters, and neglecting the really important point, namely, the sugar-content. Very soon afterwards Vilmorin commenced selecting sugar-beet for composition, his first method being to pick out for seed-mothers roots of high specific gravity. This method he soon changed, and began to select for high specific gravity of juice. In 1867 Marck suggested that in selecting there should be an actual determination of the percentage of sugar in the juice by means of the polarimeter, and that, in order to increase the sugar without increasing the other solids of the juice, which interfere with the crystallisation of the sugar, the percentage of total solids in the juice should also be determined, and the sugar calculated as percentage of the total solids, or quotient of purity as it is called. The actual selection is then made for high percentage of sugar combined with high quotient of purity.

The success of this method of selection is shown by the following figures, and side by side with them are printed figures for the percentage of dry matter in mangels :—

Year.	Sugar Beet. Sugar in Juice. Per cent.	Year.	Mangels. Dry matter. Per cent.
1860–1861 ...	10·93	1852	11·5
1868–1869 ...	11·34	1880–1884 ...	10·97
1870–1872 ...	11·80	1885–1889 ...	11·78
1873–1874 ...	12.65	1890–1894 ...	13·04
1882–1883 ...	13·60	1895–1900 ...	11·80
1885	14·00	1902	12·9
1886	15·00	1903	11·8
1889	15·04	1904	12·3

These figures bring out several important points. For instance, the steady improvement of the sugar-beet from about 1870, when chemical selection was established on a satisfactory basis, is very apparent, and contrasts markedly with the constancy in the composition of mangels during the last fifty years.

The sugar-beet has been selected for a definite purpose, and great improvement for that purpose has been brought about. The mangel has been selected also, but selection has been made for such external characters as shape, colour, size, rather than for improved chemical composition. The result is that we now have many strains of improved shape, colour, size, and so on, but the average percentage of dry matter remains much as it was fifty years ago.

The question now arises: Is it possible to improve the mangel in quality, and, if so, how must the selection be carried out?

The first step, Messrs. Wood and Berry point out, is to decide what particular quality we want to improve. Mangels are grown almost entirely for food for cattle and sheep, and, unfortunately, there is very little definite information to be found as to the feeding value of the separate constituents of roots. It would appear, however, that selection for high content of dry matter would probably improve the feeding quality.

A careful comparison was made of the various characteristics (*i.e.*, weight, dry matter, sugar, specific gravity of the juice, colour of the juice, percentage of total nitrogen and of proteid

nitrogen) of 100 individual roots of a strain of Yellow-fleshed Globe, all grown side by side at the University farm in 1903.

The results showed that while there is an evident relation between the weight of root and the percentage of dry matter, and that, on the whole, there is a tendency for the weight of the root to fall as the dry matter rises, yet it is by no means true that every large root is low in dry matter. Individuals were found weighing 5 lb. and over, and containing 13 per cent. or more of dry matter. There should be no difficulty in selecting such roots as these for seed-mothers, and continuous selection in this manner should result in raising the percentage of dry matter without decreasing the cropping power.

Again, in the case of sugar, there is evidently some correlation with dry matter, roots with high dry matter content containing much sugar, but the sugar forms by no means a constant proportion of the dry matter in every individual. It should, therefore, be quite easy to continuously select for high dry matter which contains large or small proportions of sugar, whichever further work shows to be desirable.

The remaining characteristics of nitrogen, specific gravity of juice, colour and shape, did not prove to be correlated in any way, and it is concluded that the method of selection most likely to result in improvement in the feeding value of mangels is selection for high percentage of dry matter, and that in making this selection reliance must not be placed on shape, colour, or specific gravity of juice, but the dry matter in each individual root must be actually determined. Experiments have already been begun in this direction.

Notes as to Tomato Growing.

Tomatoes are very largely grown in the United States, both as a field crop and also in greenhouses. In regard to the latter method of cultivation, a bulletin issued by the United States Department of Agriculture makes some suggestions which may be of interest to English growers.

Sterilising the Soil.—The soil for the production of this crop should be well decomposed loam, made, if possible, from sods

from an old pasture, the soil of which is a rather light clay loam or a heavy sandy loam. With this should be incorporated about one-fourth of its bulk of well-rotted farmyard manure, preferably cow manure. By composting these two materials for from four to six months before they are required for use a very satisfactory soil for the forcing of tomatoes will result.

It is not well to allow the soil to remain in the greenhouse longer than a single season. It becomes somewhat exhausted, and is likely to become infested with injurious forms of life, particularly nematodes, which cause root-knots upon the tomato plants. This trouble, however, can be removed by sterilising by steam. Sterilisation can be carried on in boxes 12 in. to 15 in. or 18 in. deep, in the bottom of which are steam pipes with perforations every 2 in., the perforations being about one-sixteenth of an inch in diameter and so placed that they are on the under-side of the pipe. The pipes are arranged in coils and distributed far enough apart to allow the blade of a spade to be worked between them. A lid to fit the top of the box should be provided, and the box should be made to hold one or two cartloads of compost. After subjecting the soil to the action of the steam a sufficiently long time to cook a potato buried in it the soil will have become thoroughly sterilised.

Pollination.—Under the conditions existing in a greenhouse it is necessary to pollinate the flowers of the tomato artificially, otherwise only a very small percentage of fruits will set. A satisfactory way to do this is to use a watch-glass, $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. in diameter, embedded in putty, at the end of a handle, of light material such as white pine, 12 in. or 18 in. long. Taking this in the left hand and a light pine stick of equal length in the other hand, pass through the house, tapping each open flower lightly, at the same time holding the watch-glass under the flowers to catch the pollen. Before removing the watch-glass from this position, lift it sufficiently to cause the stigma of the flower to dip into the pollen contained in the glass. By carefully going through the house from day to day during the blooming period nearly 90 per cent. of the blossoms which develop can be caused to set.

According to a Proclamation (No. 63 of 1905), the importation of various plants into the Colony of Natal is prohibited.

Importation of Plants into Natal.

The introduction of any grape vines, except those worked upon stocks which are resistant to the attacks of the grape *phylloxera*, is prohibited. All consignments must be accompanied by a sworn declaration to the effect that they are upon resistant roots.

The importation of all other grape vines, cuttings, grafts, or foliage thereof, is prohibited unless the special permission of the Department of Agriculture is given for their importation.

No person shall introduce from over-sea into the Colony—(*a*) Any eucalyptus, acacia and coniferous plants, or any portion thereof, with the exception of seed, except by the permission of the Department of Agriculture. (*b*) Any apple trees, except those worked on stocks resistant to the woolly aphis, nor any apple stocks except those known to be resistant to the woolly aphis, and all such consignments must be accompanied by sworn declarations to these effects. (*c*) Any citrus fruit whatsoever grown in places beyond South Africa.

The importation of stone-fruit trees and any portion thereof, including seeds from North America, is absolutely prohibited.

With reference to the notes which have previously appeared in this *Journal* as to Forestry Education (April, 1904, p. 1, and March, 1905, p. 751), it may be mentioned that the Commissioners of Woods and Forests have now published the working plan for the Alice Holt Forest prepared by Dr. Schlich, C.I.E., F.R.S., and copies may be obtained from the Office of the Commissioners, Whitehall Place, S.W., price 3d. A map of the Alice Holt Forest is published separately, price 2s.

The Alice Holt Woods.

These woods are situated at an eastern extremity of Hampshire bordering on the county of Surrey, and will now be available as a demonstration area for the practical study of forestry. In drawing up the working plan regard was had to this point, one of the objects being the provision of the best object-lesson in the treatment of woods of this description from

a practical point of view, according to the methods of scientific forestry.

The Alice Holt Woods form part of the ancient Crown property. By an Act passed in 1812, called "An Act for the Better Cultivation of Navy Timber in the Forest of Alice Holt," it was provided that the deer in the forest should be removed, and power was given to the Crown to enclose, out of the waste lands of the forest, not exceeding 1,600 acres, from such parts as should be found most convenient to be enclosed, and to be best adapted to the growth of timber, such enclosures to be freed from all manner of rights and to be made a nursery, or nurseries, for timber only, and to be accepted by the Crown as an adequate compensation for all rights of soil or other right over the remaining 827 acres of the waste lands of the forest, which last mentioned lands were to become the property of the persons having rights of Common over the forest.

The enclosures made by the Crown under that Act extended to exactly 1,600 acres. There were also 296 acres of land which were the freehold of the Crown before the Act was passed, part of which was occupied with lodges; and various small parcels allotted to the Commoners have been purchased by the Crown. The area of the forest at the present time amounts to 1,884 acres. There is evidence to show that the Alice Holt Woods have been stocked with oak for centuries past. During the last twenty-five years of the eighteenth century, and probably during the beginning of the nineteenth century, considerable quantities of oak timber were cut for the Navy, so that about the year 1810 little big timber was left. At that time it was resolved to re-plant a considerable area of the Crown lands, so as to create a reserve of oak timber for the Navy. Under this movement the Alice Holt Woods were planted with oak between the years 1815 and 1825. In the course of time the plantations were periodically thinned to such an extent that they are now too thinly stocked. The development of the oak has been very uneven. In some parts the trees have reached a fair size and shape, showing a height of 60 ft. and upwards, in others the development has been so poor that the height may be put down at from 30 to 40 ft. At the present time, there are 315 acres bearing oaks of 60 ft. in height and over, 1,146 acres of oaks from 40 to 60 ft., 331 acres

of oaks under 40 ft., making in all 1,792 acres of woods. In addition there are 31 acres of coppice and 61 acres of new plantations.

In the first-class oak woods it is proposed to cut out the trees of inferior shape and development, and to under-plant with beech. In the second and third-class oak woods, the good patches will be treated in the same way, while the inferior patches will be cleared and re-stocked with conifers.

Prevention and Cure of Foot-Rot in Sheep.*

Foot-rot is a disease from which all flocks suffer more or less, and in many cases it is the most serious trouble with which the sheep-owner has to contend. There is still some doubt as to its cause, but there is general unanimity of opinion that it is contagious.

The usual method of treatment is to pare the hoof of the affected sheep and to apply a dressing of some preparation proprietary or home-made. Detailed treatment of each hoof separately is not only a slow and somewhat laborious, business, but as it entails the turning of the sheep more or less on to its back it cannot be good for the animal, and, in the case of ewes in lamb, it is a fruitful source of abortion.

It had been noticed that the ordinary process of dipping sheep had a curative effect on foot-rot, and this was ascribed to the action of the poison on the cause of the disease. From this, it appeared probable that beneficial results would follow the walking of affected sheep through a solution of poison just deep enough to cover the hoof, and in practice this has been found to be the case.

In order to test the effects of such treatment on a considerable scale the Board of Agriculture, early in 1904, distributed thirty baths (16 ft. by 1 ft.), each accompanied by 1 cwt. of copper sulphate, to a corresponding number of sheep farmers in Great Britain. The instructions supplied were that the sheep should be walked once a month or oftener through a 5 per cent. solution of the substance (1 lb. in 2 gallons of water), after the hoofs in the case of a bad attack had been cleaned and dressed.

Reports from most of the recipients have now come in, and

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* *See* "Foot-Rot Experiments," *Journal*, Vol. XI., No. 9, p. 553.

they are quite unanimous in ascribing much benefit to the use of the bath. But it would appear from the information to hand, that still better results (especially where it is a case of curing rather than preventing) will be got by using a 10 per cent. solution (1 lb. of copper sulphate to 1 gallon water) and in stubborn cases the sheep should be put through the bath as often as once a week.

Although the Board have only experimented with copper sulphate, they are aware that other substances are employed, such as 3 oz. arsenic mixed with 3 oz. washing soda and boiled in 2 gallons of water, or 1 part of sulphuric acid to 10 parts of water. Arsenical and other sheep-scab dips may also be used to furnish the solution to be placed in the bath. It is doubtful, however, whether any substance is more effective than copper sulphate, and the latter is comparatively safe and easy to manipulate.

As a result of these experiments the following suggestions are made as to the course of treatment :—

(*a*) Bath of wood or concrete, 16 ft. long and 8 in. wide (12 in. is unnecessarily wide), sides sloping out, ends 3 in. deep, provided with cross pieces or grooves to prevent slipping, side fences close boarded and to slope out so as to admit of sheep walking easily through.

(*b*) Solution to consist of 1 lb. copper sulphate in 1 gallon of water. If prevention only is aimed at, half this strength will suffice. Time to be allowed for thorough solution.

(*c*) The copper sulphate should be bought under a guarantee of purity (98 per cent.) and, if possible, in the form of powder, not in large crystals.

(*d*) Sheep, if badly affected, should have their hoofs pared before they are put through the bath.

(*e*) A day when the grass and soil is dry should be selected.

(*f*) Copper sulphate and most of the other substances which are used being poisonous, a cover for the bath to prevent stock from drinking the solution may be an advantage. In any case the bath must be well fenced in.

(*g*) If ewes with lambs at foot are treated they should be put through very quietly, so as to prevent the solution getting on to the teats and thus into the mouths of the lambs.

(*h*) Sheep with long wool should also be put through very

quietly, or otherwise the solution may, under certain circumstances, discolour the wool.

The following is a brief summary of the reports received from the farmers who received and used the baths supplied by the Board:—

1. The treatment, though not wholly effectual, was of very material advantage. The solution might be somewhat stronger.

2. The copper sulphate solution proved as efficacious as an arsenic dip, or more so, and is to be preferred as being less poisonous. In this case a cover, which when turned up served to fence the side, was fixed to the bath by hinges.

3. Owing to regular treatment, no case of foot-rot occurred in a flock of 200 ewes.

4. The method recommended by the Board proved entirely satisfactory, all lambs affected being cured in about three weeks when they were treated directly the lameness was observed. It is suggested that in bad cases the feet of the sheep should be held in a double strength solution for a few minutes.

5. When used once a fortnight the treatment was found a very great preventive, but it did not appear to have much effect on chronic cases. The solution might be made a little stronger. In consequence of the treatment it is considered that fewer sheep were attacked by the maggot fly, while the ewes were in better condition when brought to the ram.

6. Treatment proved of decided benefit.

7. The bath was used according to instructions and found very satisfactory, but the past winter was a particularly favourable one for sheep.

8. The treatment was found quite satisfactory.

9. The sheep were put through the bath once a week, and in about a month they were all practically cured; afterwards they were treated once a fortnight.

10. In this case eighty ewes were treated which were terribly crippled with foot-rot. They were put through a bath containing a double strength solution twice a week, and after about two months they were all cured. It is suggested that ewes heavy in lamb should not be turned to pare their feet preparatory to using the bath, as three ewes which were so treated cast three pairs of dead lambs.

11. The solution was used as directed and succeeded very well. It is suggested that the troughs should have lids, so that they could be closed when not in use.

12. The treatment was considered useful in preventing the disease.

13. In this case the mixture was used at a strength of 7 lb. of copper sulphate to 10 gallons of water, and some seventy or eighty lame sheep were put through the baths seven times. They improved after every treatment, and, finally, there were only thirteen lame. It is suggested that less solution would be needed if the bottom of the bath were one-half the width.

14. In this case it is suggested that the sheep should be dipped twice a fortnight in a solution of 6 lb. copper sulphate to 10 gallons of water. The writer refers to the great saving of time and labour in dealing with a large number of sheep on a hill farm compared with treating each one singly by hand.

15. A solution of 1 lb. copper sulphate to 1 gallon of water was found very effective both as a cure and as a preventive. The farmers who used the foot-bath have combined and erected a permanent trough and pen for the sheep. It is suggested that the trough might be an inch deeper to avoid waste of solution.

16. The solution cured the lame sheep after three or four dippings, but it is not regarded as a very effective disinfectant, several sheep having fallen lame after having passed through the bath twice.

17. Very poor results were obtained with a solution of 1 lb. copper sulphate to 2 gallons of water, but when used double strength thirty sheep were cured in three weeks, dipping twice a week.

18. A flock of Shropshire sheep were very badly affected with the disease, but after treatment with a solution of 1¼ lb. copper sulphate to 2 gallons of water they became nearly free from the disease. The sheep were put on light land for a few days before treating, so as to get their feet clean and dry.

19. A solution of 1 lb. copper sulphate to 2 gallons of water was found effective as a preventive, but for badly affected sheep it should be made at the rate of 1 lb. to 1 gallon of water, in which the sheep should stand for five minutes and be treated every ten days.

20. The solution gave very satisfactory results when used as directed. The great value of the bath is the large number of sheep which can be treated together.

21. Experiments carried out by the Cambridge University Department of Agriculture showed that baths of a 5 per cent. solution (*i.e.*, 1 lb. to 1 gallon of water) at intervals of a month did not cure foot-rot when the disease was established, but a weekly bath of a 5 to 7 per cent. solution appeared capable of curing a considerable percentage of cases. When foot-rot is prevalent, weekly treatment is desirable, using the stronger solution. For badly affected sheep, it is thought that stronger solutions or an ointment should be employed. There was some evidence to show that an occasional bath will act as a preventive of foot-rot. Of twenty-two lambs, one only became lame after being put through a bath twice, although the lambs were going with badly affected ewes.

22. A solution of 1 lb. sulphate to 3 gallons of water was successful as a cure and 1 lb. to 4 gallons as a preventive when used once a week. When the treatment was begun, half the sheep were more or less affected, but after treatment there was scarcely a lame one to be seen. A dry day and dry surroundings should always be chosen.

23. The solution used at the rate of 1 lb. of sulphate to 1 gallon of water resulted in a complete cure in many cases, but in some, especially where the disease broke out at the end of the hoof, it seemed to require rather more drastic treatment.

The Epizootic Lymphangitis Order, 1905.

The Board of Agriculture and Fisheries have issued an order to take the place of the Epizootic Lymphangitis Order of 1904, which it revokes. The Board have inserted in the new Order such provisions as appear to them desirable in view of the experience gained in connection with the outbreaks which have occurred in Great Britain and Ireland since the issue of the Order of 1904. The amendments embodied in the present Order provide for (*a*) the transmission by the police of notices of outbreaks by telegraph to the Board; (*b*) immediate restriction in case of an outbreak on movement of diseased or suspected horses, and horses which have been in

contact with such horses; (*c*) detention by Notice of horses connected with the outbreak with a view to their being kept under observation; and (*d*) the issue of public warnings as to the existence of disease.

The Board do not in the Order provide for the slaughter of diseased or other horses, but propose to deal with this question by separate Order in the case of each outbreak after consideration of the special circumstances of the case. The Epizootic Lymphangitis Order, 1905, came into operation on the Fourteenth day of September, 1905.

The regulations affecting the importation of live stock into Belgium may be summarised as follows:—

Importation of Live Stock.—Belgium.*

According to regulations made under the law of September 20th, 1883, the importation, exportation, and transit of animals attacked by contagious diseases and of animals suspected of being attacked is prohibited.

When not forbidden the importation of cattle, sheep, goats, and pigs is only permitted through certain Custom Houses, and the animals are to be inspected on arrival at the expense of the importers. Animals of species designated by the Minister of Agriculture are to be quarantined, after inspection, for not more than ten days.

When an animal presented for importation is attacked, or suspected of being attacked, by contagious disease, the importer is to provide for the immediate return of the animal, together with those in contact with it, to the country of origin. In default, or when the re-entry is refused by the country of origin, the veterinary surgeon is to isolate the animals, and those attacked are to be killed without compensation.

Animals imported for through transit by rail, without unloading, are not subjected to any special control, but animals coming through for exportation by sea are not to be allowed to leave unless they are free from disease.

* Live stock import regulations have been published in this *Journal* for the following countries:—Transvaal, March, 1903; United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; and France, August, 1905.

Animals imported by sea, whether for through transit or for consumption, are to be submitted to veterinary inspection at the port of arrival. All, except those despatched for through transit, are, in addition, to undergo quarantine for a period to be fixed by the Minister for Agriculture.

Cattle, sheep, and pigs imported from countries beyond the sea must be imported through the ports of Antwerp, Ghent, or Ostend.

These animals are to be slaughtered in the abattoirs or other authorised slaughter-houses within three days of their disembarkation. The same regulations are to apply to animals arriving at these ports from other sources.

Exception to these rules can only be made on the authority of the Minister of Agriculture in the case of cattle, sheep, and pigs imported for breeding purposes.

According to regulations dated 19th January, 1905, bulls and milch cows, together with heifers which have at least four adult teeth and present evident signs of pregnancy, are to be submitted to the tuberculin test. Animals intended for immediate slaughter are excepted from this rule. A charge of 2 francs per head is made for animals undergoing the test, but they must be maintained and cared for by the importers.

Stock which are considered to be affected with tuberculosis or which are suspected of being so affected, are to be turned back, unless the owner prefers to have them slaughtered either on the spot or in an authorised abattoir.

In the case of horses the regulation of March 14th, 1897, provides that horses presented for importation are to be examined, at the time of entry, at the expense of the importer.

Horses intended for slaughter must on their entry into the country be marked with a metal label. Such animals can only be admitted on condition that they are sent direct to an abattoir, where they must remain isolated until they are slaughtered, which must be within eight days of their arrival.

Horses coming from suspected places and not declared for slaughter, horses of small value, and horses suspected of being affected with glanders and farcy, are to be submitted to the mallein test at the time of entry, and for this purpose are to be placed under observation for at least three days at the expense of the importer.

Horses considered to be affected with glanders and farcy either in consequence of the clinical symptoms which they exhibit or by re-acting under the mallein test, are to be slaughtered without compensation.

Horses imported for direct transit are not subject to these regulations.

The importation and transit of horses must take place through the ports of Antwerp, Ghent, and Ostend.

Condiments in Animal Foods.

Some experiments as to the influence of condiments on food consumption, digestibility, and milk secretion, carried out at the Hohenheim Agricultural Experiment Station by Herr Gustav Fingerling in 1902–4, have recently been published in the *Landwirtschaftliche Versuchs-Stationen* (Vol. LXII., Parts I.–III.).

The experiments, which were very carefully conducted, were divided into two parts: (1) The influence of condiments on food consumption, digestibility, and milk secretion in combination with a food poor in condimental substances; and (2) Their value when combined with an ordinary appetising food. The feeding stuff employed in (1) was artificially compounded of certain materials so as to make up the required proportions of albuminoids, fat, and carbo-hydrates, but to avoid appetising or seasoning materials. It was composed of a bye-product of straw used for manufacturing purposes, earth-nut oil, starch flour, and a bye-product of the manufacture of a protein preparation (Tropon), together with spelt-straw. Certain substances were added to supply mineral matter in the food. In the second part of the experiment a ration in common use was selected, viz., meadow hay, brewers' grains, and sesame cake.

The prepared mixtures of condiments which are sold in Germany under many high sounding names are mostly composed of combinations of the seeds of fennel, fenugreek, aniseed, caraway, and of preparations of juniper, carob, ginger, gentian, liquorice, marsh mallow, charcoal, and various salts. The seeds of fennel, fenugreek, and aniseed were chiefly employed in

these experiments, and also one or two patent compounds. The results are valuable as showing by exact experimental methods the small advantage to be obtained from preparations of this character. It may be noted, however, that the influence of condiments on the nervous system and good condition of the animals, not being a factor capable of measurement, did not receive exhaustive consideration. The conclusions arrived at are as follows :—

The condiments tested operated favourably (1) on the food consumption, so that more food was consumed, and (2) by influencing the activity of the milk glands, so that the yield of milk was increased and its quality improved. This favourable result occurred, however, only with foods which were extremely poor in appetising materials, such as the experimental food (1) mentioned above. In a normally appetising food an addition of condiments had no effect. The natural food of animals, it is observed, contains an amply sufficient quantity of seasoning matter, and the further artificial addition of condimental substances is mostly ineffectual, and may under some circumstances be directly injurious, as the long continued use of strong spices may eventually lead to a chronic stimulation and a catarrhal affection of the mucous membrane of the stomach.

The condiments investigated did not show any power of increasing the digestibility of food. It is just this property which has hitherto been chiefly attributed to them, and it has been assumed that by their appetising effect they were able to bring about an increased secretion by the digestive glands, which resulted in better use being made of the food. This view was not supported by the experiments, as with neither of the foods used was improved digestibility apparent.

So far, therefore, as the practical use of these substances is concerned, it appears that the addition of condiments is but seldom advisable, as, for example, when an unpalatable food, such as bad hay, is used. Most of the food materials used on the farm contain condimental substances in sufficient quantities, but in the occasional instances where the food is unpalatable, a trial is recommended with the seed of fennel, aniseed, fenugreek, caraway, &c. The writer concludes by urging farmers not to purchase condimental powders, which

are composed in reality of nothing but a mixture of these seeds, with the addition of some other material, such as salt, charcoal, &c., and which are sold at a very much higher price than is warranted by the value of the materials.

Egg-Laying Competition in New South Wales.

During the past three years an egg-laying competition has been held annually at the Hawkesbury Agricultural College, New South Wales. The competition extended in each case over twelve months, from April to March, and was made up of pens consisting of six pure-bred pullets not less than seven months nor more than twelve months old at the commencement of the competition. No male birds were included. The general results obtained in each year are given below. There was, it will be seen, a material difference in the price of eggs in 1904–5 compared with the previous year, which greatly affects the comparison as regards money value. The reduction in the cost of feeding forms, however, a partial set off to the fall in the value of eggs.

——	1902–3.	1903–4.	1904–5.
Number of pens	38	70	100
Winning pen's total	1,113	1,308	1,224
Lowest pen's total	459	666	532
Highest total for a month	137	160	152
Average laying per hen	130	163	154
Greatest value of eggs	£7/0/3	£7/10/4	£5/13/10
Average price of eggs	1/1	1/3¾	1/–
Average value of eggs per hen ...	15/6	17/9½	12/9
Cost of feed for hen	6/–	5/9¾	4/5½
Profit over feed per hen	9/6	11/11¾	8/3½

The report on the competition for 1904–5 by the Government poultry expert furnishes some particulars as to the system of feeding, &c.:—

The System of Feeding.—The birds were fed at regular hours, viz., 7 a.m., mash; 10 a.m., green food (according to the condition

of the grass in the pens), meat (*i.e.*, cut up boiled liver) at 3 p.m., twice a week, and grain at 4.30 p.m. The mash was composed of pollard and bran, about three-quarters pollard to one-quarter bran, more or less, according to the quality of the pollard, and mixed up with hot soup twice a week, and other days with hot water in the winter months, and cold water in the summer. The green food consisted of finely chaffed rape and lucerne. This year the grain ration was composed of three-parts wheat to one-part maize, compared with three-parts maize to one-part wheat last year; and it is considered that had the birds been fed more largely on maize the results obtained would have been quite equal to those of the previous year. Shell-grit and fresh clean water were always before the hens.

Marketing the Eggs.—The eggs were marketed in ordinary patent egg-cases, holding thirty-six dozen, packed into card-board fillers. The eggs were packed clean without washing, the dirty ones being laid aside, also any that were too large for the square space, or any that were too small. The eggs when sent to market always commanded the highest rate, and often 1d. above it.

Mortality and Disease.—During the competition, fifty-three, or 9 per cent., of the hens died. This included fourteen deaths from a heat wave, when the maximum reached 111 deg. F. in the shade. The whole of these deaths were due to diseases of an ovarian nature, caused by excessive laying, with the exception of about four cases, which were from hereditary complaints. No contagious or infectious diseases occurred.

Prices.—The prices of foodstuffs were much lower in 1904-5 than in the previous years, and there was not so much fluctuation. The prices charged under contract were 8¾d. per bushel for bran, and 9½d. per bushel for pollard. The average price for wheat was 3s. 4d., and for maize 2s. 6d. per bushel. The cost of feeding the 600 hens for the twelve months was as follows:—Wheat, £47 1s.; maize, £12 17s. 10d.; pollard and bran, £44 2s. 1d.; meat, £20; green food, £7 10s.; shell-grit, £2 10s.; total, £134 0s. 11d.

The monthly laying was:—April, 2,383; May, 3,383; June, 4,900; July, 7,782; August, 10,423; September, 10,216; October, 10,829; November, 10,286; December, 9,409; January, 7,769;

February, 7,236; March, 6,565. Grand total, 91,169 eggs, or 7,597 dozen.

The monthly range of prices for eggs was :—April, 1s. 9d. to 2s. 1d.; May, 1s. 11d.; June, 1s. 10d. to 1s. 3d.; July, 1s. 4d. to 11½d.; August, 11d. to 8d.; September, 8½d. to 7d.; October, 7d. to 7½d.; November, 8d. to 11d.; December, 10d. to 1s.; January, 1s. to 1s. 3d.; February, 1s. 3d. to 1s. 4d.; March, 1s. 6d.

The market value of the eggs was £382 12s. 7d. from which deduct the cost of feed, £134 0s. 11d., and a gross profit, excluding cost of labour, &c., of £248 11s. 8d. is left on the 600 hens. It is stated that the work of looking after the birds did not fully occupy the time of one man. Every pen showed a profit on the cost of feeding, the pen returning the smallest value leaving a margin of 14s.

A considerable number of breeds were included, but Leghorns, Orpingtons, and Wyandottes preponderated. So far as this competition is concerned it is considered that Silver Wyandottes and Black Orpingtons gave the best results.

Milk Contracts.

The attention of the Board has been drawn on more than one occasion to instances in which the conditions contained in some of the forms of milk contract in use between farmers and milk dealers have appeared to press hardly on the seller. Most Dairy Farmers' Associations have a form of contract which they recommend, and in some instances they have been successful in bringing the form of contract they recommend into general use by their members. The value of combined effort in this direction is obvious, as the necessity of concluding a contract for the disposal of their milk at what is considered a satisfactory price no doubt leads farmers in many instances to accept without demur, and to regard as of minor importance, conditions which apply only under special circumstances.

One point to which greater attention might with advantage be given is the question of what is to be held delivery to the purchaser. From the numerous complaints which have from

time to time been addressed to the Board, it would seem that churns of milk are frequently lost after they have arrived at one of the large London railway termini. The existing practice at railway stations is for the railway officials to "check in," that is, to make a note of the milk as it is unloaded. The position taken by railway companies in regard to claims for losses of milk which has been "checked in," invariably is that the consignees are themselves alone to blame for not having been present to take possession of the churns before they can be removed by unauthorised persons or stolen. The question whether the seller or the purchaser is to bear any losses which may occur depends, therefore, on the wording of the contracts, and is a point on which many of the contracts appear to be vague and indefinite.

It seems reasonable that the milk dealers should pay for milk lost after "checking in," as it lies in their power to prevent such loss by the exercise of ordinary care in taking possession of consignments of milk addressed to them. Farmers and Dairy Associations, therefore, might with advantage arrange for the insertion of a clause to the effect that, in the event of the signature of the purchaser or his servants not being taken by the railway company at the place of delivery or of arrival, "checking in" by the railway company's servants should be deemed to constitute delivery to the purchaser.

The question of the warranty as to purity is another point which farmers would do well to consider carefully before signing their contracts. The guarantee which every farmer is in a position to give is to the effect that he warrants all the milk delivered by him to be absolutely pure as produced by the cow, with all its natural fat, and free from any adulteration; that all the strippings as well as the first part of the milk shall be delivered to the purchaser, and that on no account shall the vendor allow his cows to be partly milked and deliver a portion only to the purchaser.

Many contracts, however, go further than this, and require the milk to contain not less than $3\frac{1}{4}$ or $3\frac{1}{2}$ per cent. fat. A requirement of this character no doubt finds a compensation in the price to be paid, but it is important that farmers should see that no undue penalty is to be exacted from them in the event of non-compliance with the contract in this respect.

Milk might fall below the standard set up by such contracts owing to circumstances which the farmer could not foresee or control, and in some agreements which have come under the notice of the Board the amount of the penalty for a single breach of the warranty clause appears to be so large that it might conceivably be a temptation to the purchaser to take an unfair advantage of the seller. The sample of milk, moreover, on which the enforcement of the penal clause is made to depend, is, in most of these cases, to be submitted to an analyst nominated by the purchaser, and his report is to be regarded as conclusive and accepted without dispute. This, it will be observed, gives the farmer no right of appeal and places him entirely in the hands of the purchaser. Contracts containing penalty clauses of this nature should, therefore, be avoided. In the contracts issued by the Dairy Farmers' Associations, a guarantee in the more general terms suggested above has been found sufficient to ensure equitable treatment on both sides.

French Law as to Adulteration.

The French *Journal Officiel* of the 8th July last contains a law amending the penalties for the prevention of fraud in the sale of merchandise and the adulteration of food stuffs and agricultural products. These penalties are substituted for those contained in the law of 16th April, 1897, relating to the suppression of fraud in the butter trade and in the manufacture of margarine.*

It provides that anyone who deceives, or attempts to deceive, a purchaser in regard to the nature, quality, or composition of any merchandise, its species or origin, is liable to imprisonment for not less than three months nor more than one year, and to a fine of not less than £4 nor more than £200, or to either of these penalties. The term of imprisonment may be increased to two years in case of the use of false weights or measures, or in the case of attempts to falsify in any way the analytical proceedings.

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* *Journal*, June, 1897, p. 85.

The penalties apply to persons who carry out the adulteration and to those who expose or put on sale an adulterated product or a product suitable for purposes of adulteration. Penalties are also imposed for storing or keeping such products.

Articles coming under the operation of this law are to be confiscated, and the Court may order the destruction of any condemned products to take place in front of the premises of the culprit. The Court may also direct that a notice of the sentence be published in the newspapers, and be placarded at the doors of the premises for a period not exceeding seven days.

Railway Fires Act, 1905.

This Act, which will not come into force till the 1st January, 1908, provides that when damage is caused to agricultural land or to agricultural crops by fire arising from sparks or cinders emitted from any locomotive engine used on a railway, the fact that the engine was used under statutory powers shall not affect liability in an action for such damage.

The expression "agricultural land" includes arable and meadow land and ground used for pastoral purposes or for market or nursery gardens, and plantations and woods and orchards, and also includes any fences on such land, but does not include any moorland or buildings; and the expression "agricultural crops" includes any crops on agricultural land, whether growing or severed, which are not led or stacked.

Section 2 (1) provides that a railway company may enter on any land and do all things reasonably necessary for the purpose of extinguishing or arresting the spread of any fire caused by sparks or cinders emitted from any locomotive engine.

Sub-section (2) provides that a railway company may, for the purpose of preventing or diminishing the risk of fire thus caused in a plantation, wood, or orchard, enter upon any part of the plantation, wood, or orchard, or on any land adjoining thereto, and cut down and clear away any undergrowth, and take any other precautions reasonably necessary for the purpose; but they shall not, without the consent of the owner, cut down or injure any trees, bushes or shrubs.

Sub-section (3) requires that a railway company exercising powers under this section shall pay full compensation to any person injuriously affected by the exercise of those powers, including compensation in respect of loss of amenity.

This Act is not to apply in the case of any action for damage by fire brought against any railway company unless notice of claim and particulars of damage, in writing, shall have been sent to the said railway company within seven days of the occurrence of the damage as regards the notice of claim, and within fourteen days as regards the particulars of damage.

Agricultural Loans in Queensland.

The Government of Queensland have issued revised Regulations, dated December 21st, 1904, dealing with the granting of loans under the Agricultural Bank Act, 1901.* Advances not exceeding 12s. in the £ of the fair estimated value of the holding are granted for the payment of liabilities, for the purchase of stock, machinery, or implements, and for the carrying out of improvements, such as clearing, fencing, draining, provision of wells, reservoirs, buildings, &c. The advances to any one person are not to exceed £800, and applications not exceeding £200 are to have priority.

Under the Act, interest is to be paid by the borrower at the rate of 5 per cent. for the first five years; after which the amount must be paid off within a term of twenty years by half-yearly instalments of £4 0s. 3d. for every £100.

Notes from Foreign Office Reports.

Dairy Show at Chicago.—The Board have been informed, through the Foreign Office, that a National Dairy Show will be held in Chicago in February next, and that it is hoped by the Executive Committee that British, especially Canadian, butter and cheese manufacturers will exhibit. A good opportunity will also be offered for bringing before the public any dairy machinery.

* *Journal*, June, 1902, p. 106.

Breeding Stock for Chili.—A good opening is reported from Chili for British breeders of bulls and cows to do business at Talcahuano with local breeders. The British Vice-Consul says: "There is a marked inclination to improve stocks by inter-breeding with British cattle, and I shall be only too pleased to furnish interested people with names of dealers here. Another good way would be to advertise in a Chilian newspaper, quoting prices placed on board in a British port." (*Foreign Office, Annual Series*, 3,465.)

Chemical Manures for Spain.—The British Consul at Malaga (Mr. J. G. Haggard) reports that in view of the increasing amount of attention which is being drawn to the importance of the use of chemical manures on a much larger scale in Spain, it is only reasonable to suppose that agriculturists will be larger buyers than heretofore, and British manufacturers will probably find it worth their while to give some special attention to the Malaga market. Their Continental competitors are already doing so. Whilst imports from the United Kingdom under this head were slightly smaller in 1904 than in the previous years, those from Germany and France showed a considerable increase. (*Annual Series*, No. 3,458.)

Sectional Volumes of Leaflets.

The Leaflets of the Board of Agriculture and Fisheries are now issued in sectional volumes, at a price of 1d. per volume, post free. They are in paper covers, and are issued under the following headings:—(1) Acts of Parliament, Co-operation, and Miscellaneous Subjects; (2) Farm Animals, their Breeding and Management; (3) Poultry and Bees, their Breeding and Management; (4) Farm and Garden Crops; (5) Wild Animals, Birds, &c.; (6) Insects injurious to Crops other than Bush and Orchard Fruit; (7) Insects injurious to Fruit Trees and Bushes and to Forest Trees; (8) Fungi injurious to Crops and Fruit. These volumes can be obtained on application to the Secretary, Board of Agriculture and Fisheries 4, Whitehall Place, London, S.W. Letters of application need not be stamped.

ADDITIONS TO THE LIBRARY DURING AUGUST.

Africa—

Cape of Good Hope.—Geological Commission. Report for 1904. (181 pp.)
Gold Coast.—Report on Rubber. (15 pp.) 1905.
Transvaal.—The Design and Construction of Small Irrigation Canals. (75 pp. + xxxix. plates.) 1905.

Canada—

Statistical Yearbook of Canada for 1904. (792 pp.) 1905.

Denmark—

Rostrup, S.—Vort Landbrugs Skadedyr blandt Insekter og andre lavere Dyr. (264 pp.) 1904.
Rostrup, E.—Sygdomme hos Landbrugsplanter foraarsgagede af Snyltesvampe. (184 pp.) 1903.
Femtende Beretning om den under Landbrugsministeriet sorterende landokonomiske Konsulentvirksomhed, 1903. (319 pp.) 1904.
Aarsberetning om Det kongelige danske Landhusholdningsselskabs Virksomhed i 1904-1905. (313 pp.)
Larsen, H. C.—Landokonomisk Aarbog for 1905. (188 pp.)

Germany—

Fruwirth, C.—Die Zuchtung der landwirtschaftlichen Kulturpflanzen. Band I. Allgemeine Züchtungslehre. (345 pp.) 1905.
Hufnagl, L.—Handbuch der kaufmannischen Holzverwertung und des Holzhandels. (318 pp.) 1905.
Deutsche Landwirtschafts-Gesellschaft:—
Arbeiten, Heft 104.—Die Landwirtschaft in den Nord-Zentralstaaten von Nordamerika. (26 pp.) 1905.
Heft 105.—Der Fleisch-, Milch- und Futterertrag einiger Dauerweiden. (26 pp.) 1905.
Heft 106.—Dungungsversuche mit Kalk. (276 pp.) 1905.
Heft 107.—Sonderauschuss für Pflanzenschutz, 1904. (288 pp.) 1905.
Heft 108.—Die offentlichen Massnahmen zur förderung der Rinderzucht, 1904. (502 pp.) 1905.
Heft 109.—Erbsen-Anbauversuche 1902 bis 1904. (102 pp.) 1905.
Kirchner, Dr. O.—Die Krankheiten und Beschädigungen unserer landwirtschaftlichen Kulturpflanzen. 2 Lieferung. (97-192 pp.) *See Journal Vol. XII.*, p. 313.

Great Britain—

Simpson, J.—Estate Nursery. (78 pp.) 1905.
Walker, A. S. and Mackie, P. J.—The Keeper's Book. (348 pp.) 1904.
"Home Counties."—Country Cottages. (218 pp.) 1905.
Cornes, J.—Modern Housing in Town and Country. (196 pp.) 1905.
Cambridge University.—Guide to Experiments conducted in the Eastern Counties, 1905. (67 pp.)
Slater, J. A.—The World's Commercial Products. (163 pp.)
Sessions, H.—Cattle Tuberculosis. (120 pp.) Second Edition, 1905.
Midland Agricultural and Dairy Institute.—Experiments with Crops and Stock. Reports for 1904–5. (126 pp.)

Holland—

De Rijks Hoogere Land-, Tuin-en Boschbouwschool te Wagenien. (128 pp.) 1905.

India—

Federated Malay States.—Negri Sembilan. Administration Report for 1904. (21 + xxv. pp.)

Ireland—

Department of Agriculture &c.—Instruction in Bee-keeping. (90 pp.) 1905

Italy—
Ministero di Agricoltura.—Annali di Agricoltura, 1905. (225 pp.)

Japan—
Resumé Statistique de l'Empire du Japon, 19e Année. (163 pp.) 1905.

Norway—
Beretning om Veterinærvaesenet og Kjødkontrollen i Norge, 1903. (290 pp.) 1905.

South America
British Guiana.—Botanic Gardens Report for 1904–5. (33 pp.)

United States—
Sargent, C. S.—Manual of the Trees of North America. (826 pp.) 1905.
Bureau of Chemistry:—
Bull. 93. Experiments in the Culture of Sugar Cane and its manufacture into Table Sirup. (78 pp. + 5 plates.) 1905.
Bull. 95. Influence of environment upon the Composition of the Sugar Beet, 1903 (39 pp.) 1905.
Office of Experiment Stations:—
Bull. 155. Agricultural Instruction for Adults in the British Empire. (96 pp.) 1905.
Farmers' Bulletin No. 227:—Experiment Station Work, XXX. (32 pp.) 1905.
Bureau of Forestry:—
Circ. 35. Forest Preservation and National Prosperity. (29 pp.) 1905.
Bull. 59. Maple Sugar Industry. (56 pp. + viii. plates.) 1905.
Bull. 61. Terms used in Forestry and Logging. (53 pp.) 1905.
Bureau of Plant Industry:—
Bull. 79. Variability of Wheat Varieties in resistance to Toxic Salts. (48 pp.) 1905.
Bull. 80. Agricultural Explorations in Algeria, (98 pp. + iv. pp.) 1905.
Bull. 81. Evolution of Cellular Structures. (23 pp.) 1905.
Bull. 82. Grass Lands of the South Alaska Coast. (35 pp. + iv. plates.) 1905.
Bull. 83. Vitality of Buried Seeds. (20 pp. + iii. plates.) 1905.
Bureau of Soils.—Circ. 16. Manurial Requirements of the Cecil Silt Loam of Lancaster County. (7 pp.)
Bureau of Statistics:—
Foreign Markets for American Cotton Manufactures. (313 pp.) 1905.
Kansas State College.—Bull. 129. Kansas Mammals in their relation to Agriculture. (331–404 pp.) 1905.
New Jersey State Experiment Station:—
Report for 1903–4. (952 pp.) 1905.
Ohio Agricultural Experiment Station:—
Bull. 150. Ohio Soil Studies. (80-145 pp.) 1904.
Bull. 151. Proceedings of Annual Meeting of the Ohio State Board of Agriculture, College of Agriculture, Ohio State University, &c., June, 1904. (146–194 pp.) 1904.
Bull. 153. Forcing Tomatoes. (27 pp.) 1904.
Bull. 154. Varieties of Strawberries. (28–63 pp.) 1904.
Bull. 155. Silage *v.* Grains for Dairy Cows. (64–85 pp.) 1904.
Bull. 156. I. Tobacco Diseases; II. Tobacco Breeding. (86-114 pp.) 1904.
Bull. 157. Winter-Killing of Peach Trees. (115–134 pp.) 1904.
Bull. 158. Forestry Investigations. (135–164 pp.) 1905.
Bull. 160. Codling Moth. (196–214 pp. + v plates.) 1905.
Bull. 161. Experiments with Fertilizers on Tobacco. (214–228 pp.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

Average Prices of Live Stock in England and Scotland in the Month of August, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 8	7 2	36 7	33 7
Herefords	7 8	7 1	—	—
Shorthorns	7 7	7 0	35 8	32 10
Devons	7 10	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7½	6¾	8	6¼
Sheep :—				
Downs	8½	7¾	—	—
Longwools	7¾	7¼	—	—
Cheviots	8¾	8¼	8½	7¾
Blackfaced	8	7½	8	7¼
Cross-breds	8¼	7½	8½	7¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 7	6 1	6 3	5 7
Porkers	6 10	6 5	6 10	6 2
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 2	17 7	21 6	15 0
,, —Calvers ...	19 12	16 14	18 8	15 5
Other breeds—In Milk ...	17 4	14 15	20 3	16 3
,, —Calvers ...	—	16 5	20 1	16 1
Calves for Rearing	2 1	1 12	2 2	1 8
Store Cattle :—				
Shorthorns—Yearlings ...	8 12	7 6	9 7	7 19
,, Two-year-olds	12 18	11 7	13 9	11 3
,, Three-year-olds	16 8	14 11	14 15	—
Polled Scots—Two-year-olds	—	—	15 9	11 16
Herefords— ,,	15 5	12 12	—	—
Devons— ,,	12 14	11 18	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	34 3	30 3	—	—
Scotch Cross-breds ...	—	—	27 0	22 9
Store Pigs :—				
Under 4 months	25 6	19 3	23 6	18 9

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	51 6	51 0	49 0	49 0	56 0*	53 6*
	2nd	49 0	46 0	46 6	—	53 6*	47 6*
Cow and Bull ...	1st	—	43 0	43 0	41 0	44 6	41 0
	2nd	—	37 6	38 6	37 0	37 6	35 0
U.S.A. and Canadian :—							
Birkenhead killed	1st	48 0	48 6	46 0	47 0	47 0	49 0
	2nd	42 6	41 6	42 0	43 0	43 0	43 0
Argentine Frozen—							
Hind Quarters ...	1st	30 6	31 6	30 6	31 0	30 6	31 0
Fore ,, ...	1st	22 0	22 6	21 0	21 0	22 0	22 0
Argentine Chilled—							
Hind Quarters ...	1st	39 6	41 6	39 0	38 6	—	41 6
Fore ,, ...	1st	23 6	27 0	23 6	23 0	—	28 6
American Chilled—							
Hind Quarters ...	1st	53 0	52 6	52 0	52 0	54 6	54 0
Fore ,, ...	1st	32 6	31 6	31 6	31 6	32 6	33 0
VEAL :—							
British	1st	63 6	57 6	58 0	69 6	—	70 0
	2nd	54 0	46 0	48 6	63 0	—	—
Foreign	1st	64 6	—	—	—	—	52 6
MUTTON :—							
Scotch	1st	70 0	—	69 0	70 0	73 0	69 6
	2nd	65 6	58 6	65 6	65 6	62 6	60 0
English	1st	66 0	67 6	65 6	64 0	—	—
	2nd	60 6	53 6	60 0	59 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	55 6	58 6	60 0	—	—
Argentine Frozen ...	1st	35 0	35 6	35 0	35 0	34 0	36 0
Australian ,, ...	1st	31 0	32 6	34 0	34 0	34 0	—
New Zealand ,, ...	1st	43 0	46 6	46 6	46 0	35 0	—
LAMB :—							
British	1st	73 0	67 6	69 0	70 0	73 6	70 0
	2nd	67 6	62 0	65 0	65 0	67 0	61 0
New Zealand ...	1st	51 0	53 6	53 6	52 6	52 6	56 0
Australian	1st	46 6	50 0	49 0	49 0	46 6	—
Argentine	1st	—	47 6	—	—	44 6	46 6
PORK :—							
British	1st	59 6	56 0	55 6	55 6	53 0	54 0
	2nd	53 0	47 0	50 6	50 6	50 0	46 6
Foreign	1st	56 6	57 6	55 0	55 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ..	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1	30 8	22 5	19 10	24 10	18 4	16 6	18 3
,, 20 ...	27 10	26 9	30 10	23 7	20 4	24 8	18 5	16 7	18 5
,, 27 ...	27 8	26 9	30 11	23 7	19 8	24 4	18 5	16 7	18 8
June 3 ...	27 6	26 10	31 3	23 10	18 8	23 6	18 4	16 8	19 1
,, 10 ...	27 8	26 6	31 4	21 5	18 5	24 0	18 7	16 10	18 11
,, 17 ...	27 6	26 5	31 7	20 7	18 2	26 0	18 3	16 8	19 1
,, 24 ...	27 6	26 5	31 7	22 0	19 2	23 9	18 6	16 10	18 10
July 1 ...	27 9	26 4	31 8	20 7	18 8	23 2	18 6	17 1	19 7
,, 8 ...	28 1	26 6	32 1	19 11	19 8	22 11	18 3	17 1	19 6
,, 15 ...	28 3	26 10	32 3	20 5	18 9	23 10	18 7	17 6	19 7
,, 22 ...	28 7	27 7	32 2	20 10	18 10	23 7	18 5	17 6	18 11
,, 29 ...	28 11	28 0	32 3	21 0	19 9	23 11	18 6	17 10	19 3
Aug. 5 ...	29 3	28 3	31 11	20 1	19 9	22 0	18 8	17 10	18 4
,, 12 ...	29 11	28 4	30 5	21 3	19 9	22 5	18 10	17 7	16 11
,, 19 ...	29 9	28 8	28 5	20 4	22 5	23 4	18 6	16 7	16 4
,, 26 ...	30 0	29 5	27 1	22 3	23 2	23 6	18 7	16 5	15 9
Sept. 2 ...	30 3	30 2	26 11	22 5	25 3	23 5	18 5	16 3	15 9
,, 9 ...	28 6	30 0	27 1	22 4	24 10	23 4	17 0	16 1	15 11
,, 16 ...	27 5	29 7		24 2	24 9		16 4	15 11	
,, 23 ...	27 0	29 10		24 0	25 10		16 2	15 9	
,, 30 ...	26 3	29 10		23 9	25 5		15 9	15 8	
Oct. 7 ...	25 10	30 2		23 8	25 6		15 6	15 9	
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ...	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—			Wheat.		Barley.		Oats.	
			1904.	1905.	1904.	1905.	1904.	1905.
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	July	...	34 7	40 10	21 1	25 5	15 11	21 8
	August	...	36 2	39 5	21 11	24 11	16 10	21 0
Paris:	July	...	35 2	42 4	20 4	26 2	16 8	22 10
	August	...	37 9	41 0	22 2	25 7	18 8	22 1
Belgium:	June	...	29 11	31 8	20 8	24 0	17 4	21 8
	July	...	29 10	32 1	20 8	23 4	19 2	22 0
Berlin:	May	...	37 10	37 11	—	—	18 5	20 0
	June	...	38 4	38 2	—	—	17 4	19 9
Breslau:	May	...	37 10	35 2	22 5	24 6	17 1	19 3
	June	...	37 3	35 3	22 3	25 7	16 2	19 4

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of August, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	28 0	30 6	20 3	24 10	17 8	17 0
Norwich	28 1	30 2	18 9	23 0	16 0	15 7
Peterborough ...	28 2	28 2	20 7	22 6	17 2	16 8
Lincoln	28 4	29 4	22 7	22 11	17 4	17 1
Doncaster	27 8	30 8	—	—	18 3	17 5
Salisbury	28 6	30 3	21 5	25 5	17 9	17 1

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	13 9	12 9	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	113 0	111 0	114 6	111 0	112 6	110 0	113 0	—
Danish ...	121 6	119 6	123 6	121 0	122 0	120 0	122 0	—
Russian ...	103 6	101 0	116 0	111 6	101 6	99 6	103 6	—
Canadian ...	109 6	107 6	111 6	109 0	111 6	108 0	112 0	—
Argentine ...	109 0	106 0	109 0	107 0	—	—	—	—
CHEESE :—								
British, Cheddar	74 0	71 0	—	—	67 0	62 0	58 0	53 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	59 6	51 0	62 6	55 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	54 0	53 0	55 0	54 0	54 0	52 6	53 6	50 0
BACON :—								
Irish	70 6	67 6	71 0	66 6	70 6	66 0	67 6	65 6
Canadian ...	62 0	59 0	64 6	61 6	62 0	59 0	62 6	56 6
HAMS :—								
Cumberland ...	100 0	98 0	—	—	—	—	—	—
Irish	104 0	100 6	—	—	—	—	102 0	92 0
American (long cut) ...	56 6	54 6	56 0	50 0	56 6	50 6	56 6	53 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	12 3	10 0	—	—	—	—	—	—
Irish	11 1	9 7	9 5	8 9	9 2	8 4	9 3	8 6
Danish ...	10 2	8 5	10 3	8 0	9 10	9 4	9 11	8 5
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	61 0	54 0	—	—	—	—	—	—
Main Crop ...	—	—	—	—	70 0	60 0	—	—
Up-to-Date ...	65 0	60 0	44 6	38 6	51 6	36 6	60 0	—
HAY :—								
Clover... ...	85 0	75 6	90 6	65 0	81 0	66 6	68 0	62 6
Meadow ...	75 0	66 6	64 0	59 0	—	—	66 0	60 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	August.		8 Months Ended August.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	77	75	592	970
Swine Slaughtered as diseased or exposed to infection ...	267	283	2,672	4,521
Anthrax :—				
Outbreaks	55	68	647	659
Animals attacked	69	140	914	1,047
Glanders (including Farcy) :—				
Outbreaks	112	122	827	1,030
Animals attacked	180	194	1,429	1,827
Sheep-Scab :—				
Outbreaks	6	5	654	1,065

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	August.		8 Months Ended August.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	9	31	39	139
Swine Slaughtered as diseased or exposed to infection ...	354	459	1,200	2,889
Anthrax :—				
Outbreaks	1	—	3	2
Animals attacked	1	—	3	2
Glanders (including Farcy) :—				
Outbreaks	1	—	13	8
Animals attacked	2	5	35	29
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	3	3	228	371

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XII. No. 7.

OCTOBER, 1905. [NEW SERIES.]

FORMATION OF PERMANENT PASTURES.

THE SELECTION OF SEEDS FOR LAYING DOWN LAND TO GRASS.

The subject of this paper is not one to which the farmer has given much personal attention. He hardly expects to be asked for an opinion on the quality of the different pasture plants, and he leaves to others the task of prescribing the mixture that is to be used for sowing down his land to grass. Of annual crops he has personal knowledge and experience; he has made his mistakes, and he has learned to avoid them; but of this permanent crop he has no experience. He sows his land, and his mistake, be it small or great, must stand; he does not record his experience, and the son's practice is no better than the father's. In this paper I write from the farmer's standpoint, and in preparing it I have tried to obtain the benefit of the farmer's experience, but have failed to find anything worthy of record. On the one hand the advice of the practical man is, "Go to a trustworthy and experienced seedsman, state your wants, and he will supply you"; on the other, "Mow half a good grass field early, mow the other half late, and you will have the best seeds-mixture that you can sow." Both pieces of advice may be excellent, but they do not indicate any personal acquaintance with pasture plants.

In most departments of agriculture the practice of our best farmers leaves little to be desired, but we have hitherto shown little knowledge or skill in forming permanent pastures. Instead, therefore, of describing our present methods I shall

trace the history of the subject, indicate where mistakes have, in my opinion, been made, and point out directions in which improvement may be looked for. Of one thing we may feel sure: until the farmer does recognise the importance of a personal knowledge of pasture plants, our grass farming will continue to be unsatisfactory. It may not be the farmer's business to procure or clean or test grass seeds, but it is his business to sow and to cultivate them. It is he that should tell the seedsman which species suit his land, and it is he that must decide how much should be sown. Seedsmen have other duties to attend to, and it is impossible that they should decide on questions of which only the practical farmer can have experience.

The sowing of pasture plants dates back to the middle of the 17th century. Walter Blyth* describes the introduction of Flanders red clover as a new improvement, and refers to the difficulty of procuring good seed in the London shops. Sainfoin and lucerne, which are also mentioned by Blyth, were quite recent introductions into England at the time he wrote. They are spoken of as French grasses; sainfoin is strongly recommended, and lucerne is suggested as worthy of an experiment. The other common leguminous fodder plants did not attract the attention of the improvers of this period, for though Blyth says of them "there are so many sorts of claver as would fil a volume," he does not consider them worth notice. Soon afterwards, however, the best of them were cultivated, for Lisle,† writing early in the 18th century, mentions a Wiltshire farmer who was in the habit of sowing wild white and red clover, and who obtained his seed from Sussex, where the plan "is practised." Lisle, too (1707), recommends the free use of manures for white clover "where it likes a ground, because it is sweet food, and by its trayling stalks takes root at the joints, and matts extreamly and soon overruns a ground, and is therefore I believe the longest liver." None of the grasses are

* "The English Improver Improved," 3rd Edition, 1652, p. 177.
† "Observations in Husbandry," by Edward Lisle, Esq., late of Crux-Easton, London, 1757, p. 250.

alluded to by Blyth, but about the time he wrote the practice of sowing perennial rye-grass must have begun. According to Miller,* the earliest mention of rye-grass was in a work on Oxfordshire published by Plot in 1677, but Worlidge, who is the first agricultural writer to mention rye-grass, probably anticipated Plot. My copy of Worlidge's "Systema Agriculturae," published in 1681, and a third edition of a work which originally appeared in 1669, contains a notice of perennial rye-grass which seems to indicate that this plant was then pretty well known. It is recommended for use on cold sour clay soils and also for light stony uplands, and Worlidge adds† "they sometimes leave it for meadow hay, it is best for horses being hard hay, and for sheep if unsound it has wrought great cures. . . . . Some sow two bushels on a statute acre, but it is best to sow three mixed with nonsuch, because of itself it is a thin spiry grass and will not be of any bulk the first year unless thickened by the other, which failing by degrees this grass thickens upon it and lasts for ever." Worlidge claims our notice as being the first writer to suggest a mixture for sowing down a permanent pasture, and he apparently was in no doubt as to the permanency of rye-grass! Although no direct reference to the practice is made by agricultural writers, it is probable that the sowing of hay seeds with clover may have begun about this time, for a century later, Stillingfleet,‡ in condemning the farmer who takes "seeds indiscriminately from his own foul hay rick," remarks that "arguments are never wanting in support of ancient customs."

The agriculturist of the 18th century gave more attention to other fodder plants than to the grasses. The *Leguminosæ* which we now cultivate—with the exception of alsyke and crimson clover, which were not introduced until about 1830—were well known at the beginning of the 18th century, and during its course, furze, burnet, and chicory were brought into prominence, but it was not until near the end of the century that the grasses attracted attention. Proof of this is furnished by Arthur Young's description (in the "Annals of Agriculture" for 1784)

* "Gardener's Dictionary," Martyn's Edition, 1807. Art. *Lolium.*
† p. 31.
‡ "Miscellaneous Tracts relating to Natural History, Husbandry, and Physick," 3rd Edition, 1775, p. 366.

of the system adopted by Coke of Holkham, the greatest farmer of the century, in the management of his pastures. In order to secure pasturage for sheep on the light soils of North Norfolk, Coke found it necessary to lay down land for two, three, or four years. In these temporary pastures he used sainfoin, red clover, white clover, trefoil, rib-grass, and burnet, but no grasses; and rye-grass is only mentioned to show that it was an inferior pasture plant to those sown at Holkham. Later on, we may remark, Coke himself became an enthusiastic advocate of the natural grasses, and especially of cocksfoot. It is not to Coke, however, but to Benjamin Stillingfleet, an 18th century naturalist, that the introduction of the natural grasses to the British farmer is due. He gave to English readers a translation of a Swedish work on pasture plants, and, stimulated apparently by the experiments recorded by the Swedish writer, he published an account of his own observations on British grasses about 1760.* Stillingfleet saw that the grasses were neglected, because their properties were unknown. They were difficult of identification, and few of them were recognised by agriculturists. He therefore gave names to British grasses, following the system of Linnæus, and these names were adopted with some alterations by Hudson in his "Flora Britannica."

In order to procure grass seeds for trial, Stillingfleet employed children to make collections, and he thus introduced pure stocks of grass seeds. It was apparently his advocacy which secured for grasses the attention of the Society of Arts. In 1768 this Society offered a premium of £10 for the greatest quantity of land (not less than an acre) sown with vernal-grass seeds; in 1769, a gold medal for the best account of the properties and value of any two or more of the natural grasses; and in 1776 it gave money prizes for collections made by hand of the seed of foxtail and dogstail grasses.† The Society of Arts also introduced cocksfoot seed from Virginia under the name of orchard grass, and about the same time (1763) timothy was also introduced from the States, where it was cultivated as "herd" grass. These introductions were, of course, unnecessary, as both grasses were natives of Britain, and very common.

* "The Swedish Pan" and "Observations on Grasses" are appended to his Miscellaneous Tracts.

† Lawson's "Vegetable Products of Scotland," Division II., Section I, 1852.

In 1789, William Curtis, the botanist, published "Practical Observations on the British Grasses," in which he gave the results of his observations of turfs cut from typical pastures, as Fream did 100 years later in the *Journals of the Royal Agricultural Society of England*.* Curtis prepared the way for George Sinclair, whose "Hortus Gramineous Woburnensis," published in 1824, is still the source to which most of the information on grasses current to-day may be traced.

The chief agricultural writers on British pasture plants since Sinclair's time have been Lawson, Faunce de Laune, Fream, Carruthers, Sutton, and Elliot. Of these De Laune has perhaps attracted most attention, for although he contributed but one article to the *Journal of the Royal Agricultural Society of England*,† he propounded views which were more or less new to the agriculturists of his day, and which gained a great deal of support. De Laune's article was opportune, and did good by calling attention to the condition of the grass seed trade. There can be no doubt that we owe the general high level of quality in our grass seeds to-day to the outspoken criticism which a former generation of seedsmen received from him. De Laune did good, too, by bringing to notice grasses which there was a disposition to neglect, but, like many pioneers, his views were extreme, and his followers have unfortunately claimed for them an importance which they do not deserve.

De Laune's great recipe for the formation of a permanent pasture was to select and sow the right species. "On the whole," he writes, "the main point to be attended to is the employment of the best seeds"; and again, "the preparation of the land is not, in my opinion, of prime importance." These statements, which were doubtless quite correct for the particular soil of De Laune's Kent estate, have led to an exaggeration of the importance of the seeds-mixture as compared with the preparation, sowing, manuring, and management of the land. This exaggeration has had unfortunate results, and the very precision with which De Laune's example mixtures were prepared has proved a stumbling-block. It is necessary, of course, to sow the right plants, but the success of a pasture

* See articles on "The Herbage of Old Grass Lands," in Vols. for 1888 and 1890.
† Vol. XVIII., 2nd Series, 1882.

is not ensured by sowing down permanent grasses in the proportions in which one would like to find them twenty years later. There is no direct and simple relation between the "mixture" and the "old pasture."

The view, however, which is chiefly associated with De Laune's name is expressed in the following quotation:—"The grasses most pernicious to newly-formed pastures are rye-grass in all its varieties, and Yorkshire fog." Now this is a very emphatic statement, and De Laune not only convinced himself of its truth, but persuaded others. The experimental seeds-mixtures, for example, which were laid down in 1895 by the Royal Agricultural Society of England, contained no perennial rye-grass.* Mr. Elliot, of Clifton Park, condemns this species, and Mr. Hunter, of Chester, a leading seedsman, does not include it in his best mixtures. On the other hand, another prominent seedsman, Mr. Martin Sutton, author of our most useful English text-book on pastures, speaks well of it; Dr. Fream has shown that perennial rye-grass is abundant in our best English pastures; and Carruthers, who challenged the high percentages obtained in Fream's analyses, himself found perennial rye-grass on ten out of fourteen pastures which he examined.† Stebler, the Continental authority, whose "Best Pasture Plants" (translated by M'Alpine) is a standard work, also recommends rye-grass. Personally, I regard rye-grass as among the best of our pasture plants, and I cannot remember having seen a good old pasture in which it was not common; at the same time, I think that there has been a tendency to sow too much in our ordinary mixtures. Before discussing the seeds-mixture, however, I will indicate why such contrary opinions of the value of rye-grass have been expressed.

De Laune was unfortunate in his early experiences. He first laid down land to grass in 1873, and, having no previous knowledge of the subject, he failed. He then began to study the pasture plants, and he ordered seeds of those which seemed most likely to suit his land. But he suffered at the hands of the seedsmen, and obtained from them little else than rye-grass. Anyone who has had experience in sowing down rye-grass

* "Final Report on Grass Experiments," *Journ. R.A.S.E.*, 1904.
† *Journ. R.A.S.E.*, 1890.

knows that unless it is liberally treated it will usually make a poor show after the second season, and from De Laune's reference to the opinions expressed by Carrington,* it is plain that he himself did not manure freely.

Dissatisfied with seedsmen and their seeds-mixtures, De Laune turned to the "Hortus Gramineous Woburnensis," and found in this admirable book much instruction. He found, it is true, that some of Sinclair's opinions were "astonishing." Such an opinion, for example, was his estimate of the relative values of perennial rye-grass, foxtail, meadow fescue, and cocksfoot, which when placed in order of merit were as 5 : 12 : 17 : 18 respectively; but after quoting Sinclair, De Laune adds, "My own experience convinces me that these proportionate estimates of Sinclair's are correct." De Laune does not appear to have made any exact experiments on the relative values of these four grasses, but he accepted Sinclair's views, and he has handed these views on to his followers. To-day, therefore, when we hear rye-grass condemned, we are listening to opinions based upon Sinclair's experiments, and it is worth while to turn back and examine them. Sinclair's grasses were grown on beds of good loam soil, and the area from which he calculated the yield per acre was four square feet. Multiplying up the produce of these small beds, he found that cocksfoot yielded hay at the rate of 5 tons per acre, and rye-grass at the rate of 1½ tons per acre. Cocksfoot, on being analysed by the imperfect methods known to Sinclair, was found to be 50 per cent. richer than rye-grass; but from Voelcker's recent analyses† we know that the composition of both grasses is very nearly the same. It was on data, therefore, to which no one now would attach importance that Sinclair's original estimate of the value of rye-grass was founded, and it is this estimate which has reached us through De Laune. It is important to notice, too, that De Laune's reference is to a section of the "Hortus Gramineous" which was modified on a later page. Sinclair made his experiments on Pacey's rye-grass, but he afterwards learned that rye-grass was a very variable plant, and that some of the varieties had a much higher value than the type he first studied. On page 412

* See *Journ. R.A.S.E.*, 1879, p. 487.
† See analysis in Sutton's "Permanent and Temporary Pastures."

of his book he significantly remarks: "The new varieties, however, of this species of grass which have been discovered of late years remove in a considerable degree the serious objections which applied to the common rye-grass." The variable character of rye-grass is discussed by Sinclair's pupil, Lawson. This experienced seedsman tells us that inferior qualities were very common in the beginning of the 19th century, and he mentions the steps taken to obtain the better sorts suited for permanent pastures. So many kinds were known in the middle of the century that we find him writing: "It now requires no little discrimination to fix on what are the most deserving of cultivation."* The highly variable character of rye-grass doubtless accounts for some of the contradictory opinions expressed regarding its value. On good soil it may be a most useful plant, and as a permanent plant on poor neglected land it may be worthless. I have noticed De Laune's views at some length because rye-grass is the only important species upon which much difference of opinion exists, and because it seems to me that a proper use of this grass is necessary for success in the formation of pastures.

Two centuries of study have made us pretty familiar with the different pasture plants. Curtis, Sinclair, Fream, and Carruthers have indicated to us the character of our best pastures, and after a lengthened discussion we have come to moderate agreement as to the kind of pasture we would like to form. Worlidge, Stillingfleet, Lawson, De Laune, Stebler, Sutton, and Elliot have prescribed mixtures for us, but we are still far from agreement as to the particular type of mixture that should be used under any given set of conditions, and experiments upon laying down land to grass are very much wanted. We are, as yet, without either the experience or the data necessary to enable us to prepare mixtures that can be recommended with any degree of certainty.

I do not forget Stebler's method of calculating the quantity of seed necessary for laying down land to grass, but I do not think that this method is of much use. Stebler's plan is often adopted in this country, however. In a bulletin recently issued by the West of Scotland Agricultural College, for example, Professor

* "Vegetable Products of Scotland," by Peter Lawson and Sons, Division II., p. 15.

M'Alpine refers to the use he has made of Stebler's tables, and he is enthusiastic in their praise. He writes as if Stebler had reduced the preparation of the seeds-mixture to a simple arithmetical problem. It is only necessary for the farmer to decide what proportion of his land he wishes occupied by cocksfoot, clover, &c., and then to figure out the quantities. "Like the engineer, plan first and afterwards calculate the number of pounds of seed required to give effect to our plan."

Before it is examined, perhaps, the method may seem attractive. Here is science once more coming to the aid of the farmer. The formation of pastures need worry him no longer, for his mixture may be "planned and planned to scale." But does the analogy hold? Can the farmer plan like the engineer? A brick has a standard size, and the plans and estimates for a wall present no difficulty, but a cocksfoot plant may occupy a fraction of a square inch or many square inches of surface. The expansion of an iron girder, as temperatures vary, is nearly the same year by year, and it may be provided for; but the white clover plant of January may have expanded five-fold, or it may be fifty-fold before July, and how is the "planning farmer" to decide whether he shall allot to it 5 per cent. or 50 per cent. of his space? So much depends on soil, manure, weather, and the other plants composing the mixture, that it seems to me to be quite impossible to forecast the space that may be required by any particular plant from the data supplied to us by Stebler. If experiments were to be made in a particular locality, a table that should be useful might be constructed on the lines indicated by Stebler, but Stebler's original figures cannot be employed in Britain with any hope of advantage.

In experiments carried out by the Cambridge University Department of Agriculture on sowing down land to grass, there have been many illustrations of the slight connection that may exist between seed-rate and crop, and it will be convenient at this stage to examine some of the figures obtained.

At Abbotsley, Hunts, in 1900, and at Saxmundham, East Suffolk, in 1903, eight different mixtures, planned by Dr. Somerville, were laid down. In both cases the soil was a poor and heavy clay; at Abbotsley, Oxford clay, and at Saxmundham, Boulder clay. The first crop at both stations

TABLE I.—RESULTS OF SOWING MIXTURES WITH AND WITHOUT RYE-GRASS AT ABBOTSLEY (OXFORD CLAY SOIL) AND SAXMUNDHAM (BOULDER CLAY SOIL).

Plants sown.	Mixture II.—(Cost 18s. 6d.)						Mixture III.—Cost (28s. 6d.)						Mixture IV.—(Cost 30s. 6d.)					
	Weight of Seed.	Percentage of Ground to be occupied by.	Composition of First Hay Crop on Boulder Clay.	Composition of First Hay Crop on Oxford Clay.	Composition of Hay Crop after three years' Pasture on Oxford Clay.	Composition of four-year-old Pasture on Oxford Clay.	Weight of Seed.	Percentage of Ground to be occupied by.	Composition of First Hay Crop on Boulder Clay.	Composition of First Hay Crop on Oxford Clay.	Composition of Hay Crop after three years' Pasture on Oxford Clay.	Composition of four-year-old Pasture on Oxford Clay.	Weight of Seed.	Percentage of Ground to be occupied by.	Composition of First Hay Crop on Boulder Clay.	Composition of First Hay Crop on Oxford Clay.	Composition of Hay Crop after three years' Pasture on Oxford Clay.	Composition of four-year-old Pasture on Oxford Clay.
	lb.	%	%	%	%	%	lb.	%	%	%	%	%	lb.	%	%	%	%	%
Perennial red clover ...	2½	10	14·4	6·7	Trace	·0	2½	10	14·0	12·5	Trace	·0	2½	10	9·1	27·0	Trace	·0
Alsyke clover	1½	10	27·4	1·5	2·9	·0	1½	10	24·4	1·4	7·1	·0	1½	10	25·0	2·4	6·2	0·3
White clover	1¼	10			0·7	6·2	1¼	10			1·1	6·8	1¼	10			Trace	1·0
Perennial rye-grass ...	24	40	44·3	90·7	40·7	31·4	6	10	33·4	81·8	41·6	25·5	—	—	0·1	1·1	10·1	0·7
Cocksfoot ...	6	15	1·1	Trace	36·3	37·8	6	15	2·6	Trace	18·5	30·0	3¾	10	2·6	23·9	20·4	29·7
Timothy ...	3½	15	9·7	Trace	14·2	8·2	3½	15	18·2	0·5	6·0	6·0	2¼	10	17·9	7·5	4·0	6·2
Meadow fescue	—	—	—	—	—	—	9	15	3·0	2·3	16·6	12·0	6	10	24·5	30·6	32·6	21·0
Hard fescue...	—	—	—	—	—	—	—	—	1·7	·0	—	—	3	10	1·8	·0	3·1	11·1
Meadow foxtail	—	—	—	—	—	—	2	15	0·1	Trace	2·4	0·9	1¼	10	0·3	Trace	3·3	2·3
Crested dogstail	—	—	—	—	—	—	—	—	—	—	Trace	—	2½	10	6·6	Trace	9·0	10·8
Rough meadow grass..	—	—	—	—	—	—	—	—	—	—	Trace	—	1½	10	7·0	2·5	1·0	1·0
Bare or weeds and moss...	—	—	2·1	1·1	3·4	16·2	—	—	2·6	1·5	6·2	18·9	—	—	4·8	5·0	8·2	15·7
Total ...	38¾	100	99·0	100·0	98·2	99·8	31¾	100	100·0	100·0	99·5	100·0	25½	100	99·7	100·0	97·9	99·8

was cut for hay, and botanical analyses of the herbage were made. At Abbotsley, after the land had been pastured by sheep for three seasons, portions of each plot were fenced off. A hay crop was cut, and this was again submitted to analysis. At the same time, the pasture plants on certain plots were counted, and the area occupied by each was approximately measured by means of a frame divided off into 144 square inches. The botanical analysis of the Abbotsley herbage in 1901 was made by the Department's Botanist, Mr. R. H. Biffen; the other hay samples were analysed by Mr. Sydney Armstrong, a senior student, who was also entrusted with the laborious work of counting and measuring the area occupied by the plants in the Abbotsley pastures of 1905. It may be mentioned that the plants were counted and measured on four separate square feet, which were selected as representative of the plots. The figures obtained from the four squares on each plot were found to agree very satisfactorily.

Three of the mixtures employed at Abbotsley and Saxmundham tested the effects of sowing increasing quantities of rye-grass. No. IV. was a mixture containing no rye-grass; in No. III. a small quantity was present; while in No. II. there was a large quantity. The figures obtained from these three mixtures will serve to illustrate the connection or want of connection that exists between the composition of the mixture and the composition of the resulting hay crop and pasture. The hay crops which were analysed weighed as follows per acre:—

—	Mixture No.		
	II.	III.	IV.
	Cwt.	Cwt.	Cwt.
Saxmundham 1904	48	46	39
Abbotsley 1901	27½	27½	21¾
Do. 1905	18¾	16¾	16½

Saxmundham met with a favourable season, while in both years the Abbotsley plots suffered severely from dry weather in May. It will be noticed that the omission of rye-grass in Mixture IV. considerably reduced the hay crop at both stations.

The exact character of the mixtures sown, and the composition of the herbage, are given in Table I. The different

columns show (1) the weight of seed sown; (2) the percentage of the surface allotted to each species as calculated from Stebler's table; (3) the composition of the first hay crop on the Boulder clay soil of Saxmundham; (4) the composition of the hay crop on the Oxford clay soil of Abbotsley; (5) the composition of the hay crop cut at Abbotsley in the fifth season, and after the land had been depastured for three years (it was cut for hay in the first year); (6) the percentage of the surface occupied by the different plants in the pasture of 1905, *i.e.*, on grass which had been cut for hay in 1901 and pastured afterwards. Each of the seed-mixtures occupied one acre, which was divided into four quarter-acre plots. These were (*a*) unmanured; (*b*) treated with 10 cwt. basic slag per acre in the autumn of 1900; (*c*) dressed with 10 tons farmyard manure per acre in 1900; while (*d*) received the residues of cake, fed to sheep in 1901 and 1902. The figures in every case represent the averages of the four plots, except in the last column, where they refer to the land manured with slag. In the case of these three mixtures, the different sub-plots were pretty much alike in 1905, and the figures obtained on the "slag" plots would approximately represent the others.

A very brief inspection of the table will serve to show how slight the connection between the seed and the crop may be. Take first the clovers. We allot to them 30 per cent. of the surface, and at Saxmundham with a fair May rainfall we find 42 per cent. in the hay produced by Mixture II., whereas on a similar soil after a dry month of May we find but 8 per cent. This result is obtained where clovers have been brought into competition with rye-grass. As the competition is removed, we find red clover increasing from 6·7 to 12·5, and finally to 27 per cent., in the hay of 1901 at Abbotsley. The percentage in the hay is not, of course, the same thing as the percentage of ground occupied, but the relationship is close enough to enable us to see that in the case of this experiment a dry month of May in one instance and the competition of rye-grass in another have determined the quantity of clover in the hay crop. "The plan to scale" has worked out fairly well with red clover in Mixture III., but this is obviously due more to chance than to planning. If we carry our investigations beyond the first hay crop we find

that in no case did those pastures which were designed to contain 30 per cent. of clover show anything like this quantity in the fifth season. When we come to grasses, a similar lack of correspondence between seeds-mixture, hay crop, and pasture may be remarked. It is true that in the case of Mixture II. the proportions of rye-grass and timothy are not far wrong three times out of four, but if we consider the remaining figures we must be convinced that this correspondence is a mere chance. Where rye-grass forms 40 per cent. of the mixture, it has formed 44 per cent. of the hay at Saxmundham, where it has had the clovers to battle with, but 90 per cent. at Abbotsley, where dry weather sapped the vigour of its rival. And again, where we sowed but 10 per cent. in the mixture, 82 per cent. appeared in the Abbotsley hay. If we turn to the figures for cocksfoot, we find a mere trace of this grass in the hay on those plots where it has been brought into competition with rye-grass. On the other hand, 10 per cent. in the seeds-mixture without rye-grass gives a hay crop containing 24 per cent. of cocksfoot.

Instead of stating the percentage of the ground to be allotted to each species, as Stebler does, an endeavour has been made in some cases to trace a relationship between the number of seeds sown and the hay crop. In Table II. are given some figures bearing on this relationship which have been taken from a report by Mr. R. H. Biffen* on the laying down of temporary pastures on two light soils in the Eastern Counties. The columns show (1) the weight of seed sown ; (2) the percentage of the total number of growing seeds formed by each species ; (3 to 6) the percentage composition of the hay crops on a very light sandy soil with chalky subsoil at Stanhoe in four successive seasons ; and (7 to 9) the hay crop on a light sandy soil on a sandy subsoil at Saxlingham in three seasons. On the Norfolk soils referred to in the following table, we see that the clover, which formed 11 per cent. by number of the plants sown, or which, according to Stebler's method of reckoning, were enough to cover about 26 per cent. of the surface, have in one case formed 25 per cent. and in the other 50 per cent. of the first hay crop. Perennial rye-grass, which formed about 30 per cent

* Third Annual Report of Cambridge University Department of Agriculture.

of the herbage in 1897 and about 11 per cent. in 1898 on the very light soil of Stanhoe, was represented by but 12 per cent. and 5 per cent. in the same seasons on the slightly heavier soil of Saxlingham. Both of these soils were light loams; the same mixture would under ordinary circumstances have been sown upon both, but we find that a slight difference in quality has been sufficient to produce from the same mixture very different

TABLE II.—TEMPORARY SEEDS-MIXTURES ON LIGHT SOILS.

Plants sown.	Weight of Seed sown 1896.	Percentage composition of seed mixture.	Stanhoe (light sandy soil). Percentage composition of Hay.				Saxlingham (light loam). Percentage composition of Hay.		
			1897.	1898.	1899.	1900.	1897.	1898.	1899.
	lb.								
Perennial red clover ...	2½	3·4							
White clover...	1	4·6	24·7	21·4	7·9	8·8	50·4	37·8	20·0
Trefoil ...	1½	3·0							
Perennial rye-grass ...	2	2·8	30·7	10·7	6·4	15·9	12·1	0·5	23·4
Cocksfoot ...	6	15·5	9·7	15·0	48·5	37·7	9·9	21·5	39·6
Timothy ...	5	41·2	16·6	13·3	5·1	5·1	20·4	18·7	4·7
False oat-grass	3	2·4	18·3	38·2	30·2	21·4	3·8	21·5	12·3
Fescues ...	2	7·0	·0	1·4	0·5	3·8	·0	·0	·0
Meadow grasses	2	20·1	·0	·0	1·4	6·5	·0	·0	·0
			Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Yield of Hay (Grass × $\frac{3}{10}$).	—		24·5	25·8	22·2	13·6	22·4	46·8	16·8

crops of hay. The rivalry in the newly sown pasture is, indeed, so keen, and the chances of the competitors are so evenly balanced, that a heavy fall of rain at one time might produce one type of pasture, and a similar fall a fortnight later might produce quite another.

These facts are, of course, well known to many farmers, who, if they understand but little about permanent pastures, are at least familiar with sowing down temporary layers, and I do not cite the figures in Tables I. and II. because of their novelty, but because these figures, relating as they do to two heavy soils and to two light soils, furnish specific instances of a fact that is usually forgotten by those who try to form new pastures, the fact, viz., that a pasture cannot be formed "to order" by writing

out a prescription of seeds. It is quite an easy thing, perhaps, to decide what a pasture ought to be, but it is another matter to form the pasture. I do not now refer to the skill shown in the farming—the preparation of the land, sowing, manuring, and grazing. All of these may profoundly modify the ultimate result, but I assume for the present that the management is what it should be, and I am writing only of the seeds-mixture. So far as it is concerned, I am convinced that we shall have no success if we content ourselves with planning pastures to scale.

How, then, should we begin? Although it is two centuries since Worlidge gave us a prescription for a pasture "that will last for ever," we have not yet learned the secret of how to make one in the best and cheapest way. Many good pastures have been laid down, and we have the prescriptions which were used, but this does not help us much, for we are not in possession of complete records of the results. Our present knowledge amounts to this. We know that if we use an abundance of good seed of all the plants which are likely to suit the soil, and if we manage the land well, we have a fair chance of producing a satisfactory sole of grass, but this knowledge does not meet the present needs of agriculture. It is his poorest land, and usually it is land which is either very stiff or very light, or high lying and exposed, that the farmer wishes to lay down to grass. Neither he nor his landlord will spend much upon it; foolishly, of course, this land is laid down with a mixture of inferior seeds, for this is what is usually meant by a "cheap mixture," and the first step is taken in the making of what will be but an addition to the wasted land of England. It is, perhaps, the high cost of the reliable mixtures at present recommended for permanent pastures, that more than anything else discourages good grass farming. The farmer lays down land with a mixture which is cheap, which his seedsman does not recommend, and in which he himself has little confidence. Can we expect him to do much for it? Can we wonder if manure and oil-cake seldom find their way into the field, or that the "new grass" is left to take care of itself? But if the farmer had confidence in his seeds-mixture, if he felt assured that it would pay for good farming, he would not neglect it, and we might with less regret see land transferred from the ploughman to the shepherd.

T. H. MIDDLETON.

(*To be continued.*)

THE USE OF LIME.

Lime in its numerous forms has been used for agricultural purposes from time immemorial, and until about forty years ago was much more extensively applied than now. Our pioneer agricultural chemists devoted great attention to this subject, and it is very fully dealt with in early agricultural literature.

The increased cost of labour, the extensive use of artificial manures—especially basic slag, which contains lime—and the great reduction in the value of corn crops, are the main causes of its greatly lessened use.

Lime occurs in nature, generally as carbonate of lime, in the form of chalk, limestone, marble, marl, and other substances, and it has been estimated that about one-sixth part of the rocks of the earth's crust consists of this material.

Lime is an essential part of plant food, and, therefore, soils which are lacking in it cannot produce good crops. It is generally considered that when soils contain less than from ·5 to 1 per cent. of lime they are deficient in it. Soils, however, which contain a good deal of organic matter may respond to lime although they possess considerably more than these amounts.

Lime has not only a direct action as a plant food, but it liberates potash and other alkalis from their insoluble forms in the soil, and thus supplies potash in a suitable condition as plant food. Lime is necessary in the conversion of the inert nitrogen of soils into plant-food nitrogen by the process of nitrification. It has also a marked effect in making heavy soils more friable and less liable to cake, while it greatly assists the natural drainage of these soils. So far as is yet known lime in one form or another is the best remedy for finger-and-toe disease in turnips and swedes, which seems to occur only on soils poor in lime.*

The most common form in which this material is purchased by farmers is that known as burnt lime, lime-shells, quicklime or caustic lime. This is obtained from limestone or from chalk by burning either in a lime-kiln. Both limestone and chalk, when used for burning to produce agricultural lime of

* See Board of Agriculture Leaflet, No. 77.

good quality, should contain 90 per cent. or over of carbonate of lime ($CaCO_3$), which is simply lime in combination with carbonic acid. The burning in the limekiln drives off the carbonic acid as gas into the air. From 1 ton of pure limestone $11\frac{1}{4}$ cwt. of burnt lime are produced, while $8\frac{3}{4}$ cwt. of carbonic acid gas pass off into the air.

The burnt lime thus obtained from the lime-kiln greedily absorbs and combines with water, and readily unites again with the small amount of carbonic acid gas present in the air. It should, therefore, be as little exposed to rain and to the air as possible, and applied to the land without undue delay.

Where coal is cheap the price of good lime at the lime-kiln is probably on the average about 9s. a ton. It is usually bought by the farmer at so much a ton at his nearest station, including the cost of railway carriage.

In purchasing lime the main point is to have a guarantee of the percentage of pure lime (CaO), not carbonate of lime. It should be possible from our best limestone quarries to obtain lime guaranteed to be of not less than 85 per cent. purity, and actually better than this. It is also desirable that there should be a guarantee that not more than 4 per cent. of magnesia is contained in the lime, as there seems to be undoubted evidence that an excess of this substance is distinctly harmful to crops. There must also be no appreciable amount of unburnt limestone or chalk left in the lime.

Methods of Application.—Probably the most common method of applying lime to the soil is to put it on the land in little heaps, and there to allow it to slake naturally, or to add a small amount of water from a water-cart and then to cover up with soil. In a short time the lime will become slaked, and may be spread with a spade or shovel, after which it should be harrowed into the soil as soon as possible, as lime is much more effective when it is covered by the soil immediately it has been spread. The best method of application, however, is to slake the lime into a fine powder, as is done by a mason's labourer, before applying it to the soil. In doing so the lime shells are spread in layers about a foot deep, one above the other, in a sheltered position, each layer being slaked with water at the rate of rather under 6 cwt. per ton of lime when the latter is good, and less

in proportion for inferior lime. Finally, the heap is covered with half a ton or less of sand for each ton of lime. The heap thus made will keep the lime for a considerable time. Before using, the heap is screened through a three-eighth-inch gauge locking screen, which costs about 18s. The lime thus slaked is now in a fine powdery condition, and the sand mixed with it renders the spreading a somewhat less dusty process. One ton of good lime or lime shells absorbs about 6 cwt. of water, the lime being converted into hydrate of lime in the process of slaking or slackening. Lime when over slaked gets into a pasty condition, after which even distribution in the soil is impossible. When slaking has been properly done, the lime is in the form of a fine dry powder, and may be carted to the land and distributed by hand direct from the carts, a process which must be thoroughly done. It is much better, however, to adopt the American plan, *i.e.*, to use a good manure distributor, to which old bagging should be attached at the sides and behind. This trails along the ground and prevents much of the discomfort that is otherwise caused by the blowing about of the fine lime. Glasses for eyes and protective devices for the nostrils and mouth are also used by men who do this work.

The quantity of lime to apply per acre varies from 2 to 3 tons of lime shells at intervals of six or eight years. Smaller dressings of about 1 ton per acre at fairly frequent intervals are now recommended by many. Considerably larger quantities are used in the treatment of newly reclaimed land rich in organic matter and plant food.

The improper application of lime in many cases results in its being of very little service. The writer, some time ago, saw some turves cut from an old pasture field in which two distinct layers of lime were visible, one about two inches deep, which had been applied eight years ago, and one about six inches deep, which had been applied over thirty years ago. In both cases the lime had been applied in a lumpy condition to the surface of the pasture and had gradually sunk owing to the action of earthworms and other agents, but as it had never really mixed with the soil the good effects of both dressings must have been greatly limited thereby.

Purity.—The better-class limestones of the Mountain Lime-

stone, the Great Oolite and the Portland Limestone are usually of high purity, but many of the Magnesian Limestones contain as much as 40 per cent. or over of carbonate of magnesia. There are usually considerable variations in the purity of limestone beds in the same quarry, and it is very desirable that only the purest of these should be burnt for agricultural lime. Most of the beds of Magnesian Limestone in Durham contain large amounts of magnesia, but there are beds of limestone—usually those which are hard and grey—in most quarries of Magnesian Limestone in that county which are very free from magnesia, and would make good agricultural lime.

Ground lime.—This is simply lime (lime shells) which is ground to a fine powder. This is more expensive than lime, as the grinding usually costs about 6s. a ton, and as bagging is necessary, there is an additional charge of about 3s. a ton for bags. Owing to the tendency of the lime to absorb moisture and the consequent swelling, the bags generally burst so that they cannot be again used. The cost of grinding could be reduced to 3s. a ton or under, if the output could be materially increased. Ground lime should contain not less than 85 per cent. of lime (CaO), but very much now sold contains far less than this. One sample examined has been found to contain under 50 per cent. of lime (CaO) and over 22 per cent. of magnesia; another contained nearly 10 per cent. of unburned limestone, while about 25 per cent. of the lime had become slaked, and there was under 50 per cent. of lime (CaO) in the sample.* Dr. Voelcker states that "it is not infrequently found to be of inferior quality," and gives an analysis showing more than 20 per cent. of stone in a sample received by him.† There is reason to suspect that some of the lime that has become slaked into a fine powder at the limekiln may occasionally find its way into the bags of ground lime. The amount of slaked lime found in some samples cannot all be accounted for by the slaking that may take place between the limekiln and the farm. A good sample may cost about 18s. a ton at the limekiln. The cost might be reduced, as already indicated, if the demand were greater and if the railway companies would carry it at the same rate as ordinary

* Analysis by Mr. Collins.
† *R.A.S.E. Journal*, Vol. LXV., p. 255.

lime, instead of the considerably higher rates now charged by some of them.

From 30 to 50 per cent. less ground lime should be applied than shell lime, as the distribution of the former can be more perfectly carried out. It is usually applied by means of a manure distributor.

Ground limestone.—This must not be confused with ground lime. It is difficult to grind, and has been found to be of little advantage.

Gas lime.—This is a by-product in the manufacture of coal gas, for which lime is used as a purifying agent. Fresh gas lime usually contains from 28 to 40 per cent. of water, and on the average only about 34 per cent. of the equivalent of lime (CaO), only a small proportion being caustic lime. It also contains small amounts of sulphocyanides and sulphides, which are virulent plant poisons. When, however, it is carefully spread on the land and exposed to the air for at least two months (all lumps being broken and spread) these are practically rendered innocuous. Mr. Collins found that gas lime spread on the land in a thin layer for about ten weeks had become safe, and had also lost much of its moisture. The Glasgow Corporation now use a plant for pulverising the gas lime produced at their gas-works, and make a charge of 6d. a ton to purchasers who desire it so pulverised. This form of lime is probably most usefully applied to the hay stubbles in the autumn or early winter, on which it should be carefully spread and not ploughed in for at least eight weeks afterwards. The amount applied may vary from two to four tons an acre. On soils poor in lime the oat crop which follows may be considerably benefited. Its value is low. At considerable distances from a town its use is not profitable, and at moderate distances it is so only if railway rates are low and the distance to cart is not excessive.

Chalk.—This is really a soft limestone, and although it becomes hard on exposure, as on the face of chalk cliffs, it is usually in a soft cheesy condition on the fresh surface of a chalk quarry, and should be applied to the land in this condition during late autumn or early winter, so that there is a good chance of the water in the chalk being frozen so as to pulverise the chalk lumps and insure distribution in the soil.

Chalk, after the flints are removed, is usually a very pure form of carbonate of lime, but even when fairly pure it contains little more than the equivalent of about 50 per cent. of lime (CaO). For this reason, and also because it is unburned, much more chalk than lime is applied per acre. Chalk acts somewhat like lime but more slowly, and although useful for checking finger-and-toe is not so efficacious as lime.

Marls are really mixtures of earthy matter and carbonate of lime, but their consideration is beyond the scope of this paper.

It may be well to state here that while good lime (lime shells) may contain 90 per cent. of lime (CaO), fresh gas lime contains on the average only about 34 per cent., and chalk only about 52 per cent. of the same substance. It therefore requires over $2\frac{1}{2}$ tons of fresh gas lime and about $1\frac{3}{4}$ tons of chalk to supply the same amount of lime as is contained in a ton of the best lime shells.

As has already been stated, the use of lime is now considerably restricted. Careful experiments have shown that the good effects of lime for pasture can usually be more economically obtained by basic slag than by lime, a method of manuring by which the farmer gets an excellent phosphatic manure to supply him with lime free of cost. Basic slag usually contains about 45 per cent. of lime, about a third of which is probably in the active form. A dressing of half a ton of basic slag per acre therefore supplies as much lime (partly free and partly in combination) as is contained in 5 cwt. of ground lime. It is only on pastures rich in organic matter and plant food that liming is now likely to be profitable.

For arable land poor in lime the application of lime is still most desirable, this being especially so where swedes and turnips suffer from finger-and-toe disease. There is no doubt also that the quantity of corn crops is considerably improved by judicious liming, especially on soils of a somewhat moorish character. The old practice on such soils in the West of Scotland of harrowing in a light dressing of slaked lime at the time of sowing the corn crops is a most beneficial one.

The importance of guarantees as to the purchase of burnt lime (lime shells) or ground lime has already been urged. Very many of the limes now on the market contain considerably less than 85 per cent. of lime, some of them having

under 50 per cent., while many of them contain over 20 per cent. of magnesia, which is practically certain to do harm. Low qualities of lime may be due to (*a*) bad burning, (*b*) excess of magnesia, and (*c*) deficiency in lime. When limestone is burned, improper burning can be readily detected owing to the presence of lumps of unburned limestone in the product. Chalk lime when badly burned cannot be so readily detected ; purchasers of lime from chalk should satisfy themselves on this point. Purchasers of agricultural lime should therefore insist on suitable guarantees.

The authorities of the Agricultural Department of Armstrong College, Newcastle-on-Tyne, are now engaged in investigations as to the character of limes used for agricultural purposes in the North of England.

DOUGLAS A. GILCHRIST.

CATTLE-BREEDING IN GERMANY.

Relatively to the total area the number of cattle in the German Empire is about the same as in the United Kingdom, there being in each case approximately one head to every seven acres. Since 1873, when 15¾ millions were returned, the figures have been steadily rising, and in 1900, the latest year for which particulars are available, the actual number in Germany was nearly 19 millions. This increase has enabled the supply of this class of live stock nearly to keep pace with the growth of the population, there being 33·6 head of cattle per 100 inhabitants in 1900 compared with 34·5 per 100 in 1883, and 38·4 in 1873; at the same time it is considered that the live weight is now greater than was formerly the case, so that the supply per head has not in all probability materially changed. The extension in cattle-keeping is in noticeable contrast with the decline in sheep, the numbers of which have fallen from some 25 millions in 1873 to a little over 9½ millions in 1900, so that the German flocks now represent only 17 sheep per 100 inhabitants against 61 in the earlier year.

An interesting feature in connection with the cattle industry

in Germany is the distribution relatively to the size of the farms. This is shown in the following table for the year 1892, and it is probable that the relative proportions have not materially altered since that date :—

Size of Holding.	No. of Holdings	Cattle per 100 Acres.	Total Number of Cattle.
Under 5 acres	3,237,030	32	1,415,239
From 5 to 12½ acres ...	1,016,318	34	2,802,900
From 12½ to 50 acres ...	998,804	26	6,227,233
From 50 to 250 acres ...	281,767	19	4,650,993
250 acres and over ...	25,061	10	1,957,277

From these figures it will be seen that cattle are an important factor on the small holdings of Germany, 60 per cent. of the total being kept on farms under fifty acres. To this fact is probably due the active interest which is so generally taken in the industry by the Governments of all the German States. The Imperial Government, it may be noted, takes no direct action, but help both by grants of money and otherwise is given by the authorities of the individual States to societies within their areas. In the kingdom of Prussia, which may be taken as an example, the action of the State is chiefly confined to giving subventions to the Agricultural Chambers. The purposes to which these grants may be devoted are premiums or prizes at shows; encouragement of special breeds by maintaining bulls, assisting breeding societies, &c.; prizes for improved cattle steadings, and the rational care and management of cattle; assistance to herd-book societies and the encouragement of dairying.

The purposes to which the State funds of Prussia were devoted in 1903 were as follows :—*

	£.
Improvement of cattle-breeding in general	15,835
Bull and boar stations	7,930
Cattle markets and shows	1,265
Dairying, dairy instruction and dairy experiment stations ...	6,599
Instructors in cattle-breeding	1,835
Herd-book societies	305
Pig, sheep and goat-breeding	4,940
Various objects connected with cattle-breeding	5,236
Total	43,945

* Landwirtschaftliche Yahrbücher, 1904. Vol. XXXIII., Supp. II.

The distribution of these subventions is apparently left very largely in the hands of the Agricultural Chambers, who apply them according to local requirements. Of the above total £37,150 was allotted to these bodies.

Without attempting to describe in detail the steps taken for the encouragement of cattle-breeding, which vary considerably in the different German States, the following notes on some of the methods adopted may be found of interest.*

1. *Premiums or Prizes at Shows.*—In using the State grants for this purpose, conditions are usually attached which are considered likely to improve the breed of cattle in the neighbourhood. In East Prussia only the two principal breeds of cattle are admitted for awards, divided, according to age, into four classes for bulls, four for cows and heifers, and two for draught oxen. The premiums from State sources are not to be less than £3 15s., except in the case of young bulls and heifers, when they may be as low as £2 10s. The animals shown must have been six months in the district and in the possession of the exhibitor, and the same animal can only receive one prize annually. Only one-half of the premium is paid at the time of the exhibition, the balance becoming payable at the end of a year, on the owner showing, in the case of a bull, that it is still available for service, and in the case of a cow that it has borne a calf within the year.

Prizes to which somewhat similar conditions are attached are given generally at the shows throughout Germany, and the total sums distributed from State sources in this way are relatively considerable, thus £5,900 was allotted in Baden in 1901, £3,400 in Wurtemberg, £770 in Saxony, £3,070 in Bavaria, and £2,200 in Alsace-Lorraine.

2. *Premiums for Entire Herds.*—An interesting system intended to promote the breeding of cattle on small farms is that of giving prizes for the herd as a whole. These prizes are limited in East Prussia to farms not exceeding 180 acres and not having more than thirty cattle over one year. In judging, marks are allotted thus: very good, 4; good, 3; satisfactory, 2;

* See *Die Rindviehzucht im In-und-Auslande*, 1905, and *Die öffentlichen Massnahmen zur Förderung der Rinderzucht*, 1905.

less satisfactory, 1; and unsatisfactory, 0; and this scale is applied to each of the following points:—

	Maximum Marks.
(1) Proportion of herd bred on farm	4 × 3 = 12
(2) Form	4 × 4 = 16
(3) Uniformity	4 × 1 = 4
(4) Milking qualities	4 × 4 = 16
(5) Fattening or draught qualities	4 × 3 = 12
(6) Fodder supply	4 × 3 = 12
(7) Care and management	4 × 3 = 12
(8) Utilisation of the milk	4 × 1 = 4
(9) Buildings or cattle sheds	4 × 1 = 4
(10) Management of manure	4 × 2 = 8
	100

In (2) (4) and (5) each animal is to be judged and points allotted, the average of the number thus obtained being used in making up the total. Herds which receive no marks in any one of the classes (2), (4) or (6), and those which on the whole receive less than 50 marks are ineligible for a prize. The judging is to be done twice—in April and July. The prizes are not to be less than £2 10s. nor more than £15.

Awards of this character are given in several of the Prussian provinces, and also in two or three of the German States.

3. *Societies for Maintaining Bulls.*—These exist in all parts of Germany, and considerable sums are devoted to this purpose, both from State and from local sources, as their far-reaching effect as a means of improving the local breed of cattle is generally recognised. According to a plan adopted in East Prussia, the formation of these societies is encouraged in places where a bull is thought to be needed, by the grant from State funds of a loan, free of interest, for three years. The society must be constituted according to a scheme approved by the Central Chamber, by whom the grants are administered. The loan is to be applied to the purchase of a bull, which must be pure-bred of an approved breed. It must be insured by the society to its full value against fire, illness, and death, and must not serve more than sixty cows annually. The fee is to be so arranged that the repayment of the loan can be guaranteed out of the receipts in three years. The bull is placed in charge of a member, who receives no payment; but at the end of the three years the bull

becomes his property. In the event of its sale or death before that time he receives a proportion of its value at the rate of one-third for each year. When the term has expired and the loan has been repaid the society can be reconstituted, and another bull obtained in the same way. The loans range from £16 to £30. Many variations exist of the method by which the loan is granted. In some cases no repayment is demanded so long as a suitable bull is maintained; in others, a proportion of the purchase price only is lent. In several of the Prussian provinces the parish authorities act in the same way as these mutual societies.

Many agricultural chambers or central societies undertake the insurance of the bulls at a rate varying from 2 to 4 per cent.

In several districts also the agricultural chambers undertake the supply of bulls direct to the societies. For instance, in Brandenburg an arrangement has been made by which young bulls are purchased and kept until they are of serviceable age. Twice a year sales are held; in the first place, to supply mutual societies, &c., and if a sufficient stock is available, private breeders also. The charge made depends on the actual cost, the chamber bearing the expenses of the station. Prices somewhat below cost are accepted in the case of poor parishes and societies.

In Saxony two stations are maintained by the State, where young bulls, which are purchased at six months and upwards, are cared for until they reach 1 to 1½ years, when they are sold to mutual societies at about £10 under cost price, or to private persons at cost price. In eight years these stations have purchased 491 bulls of the Simmentaler breed and 318 bulls of the Oldenburg breed. They receive annually a grant of £1,400.

Breeding stations for the supply of high-class stock are also maintained in some districts. In Baden four of these stations exist, which received in 1904 a grant of £3,900. Each was originally provided with from ten to twelve cows and one bull of the first quality; the herds were increased by breeding till they contained twenty-five or thirty cows. The bulls produced, when they reach a breeding age, are sold at a moderate price to parishes and societies.

4. *Herd-book Societies and Associations of Breeders.*—These exist in very considerable numbers in Germany, many local herd-book societies existing for one breed in the same province, these local associations being federated into a Provincial Union. In addition to the registration of pure-bred animals, they endeavour to encourage breeding by other means, such as the holding of shows or exhibitions, by offering prizes, sending cattle to shows outside the district, by the publication of information useful to breeders, and in other ways.

5. *Dairy Control Societies and Milking Tests.*—A description of the methods pursued by the Danish control societies was recently given in this *Journal.** Briefly, it may be said that their object is to enable the farmer by a system of milk-testing, combined with the keeping of careful records, to check the yield of each cow in his herd with a view to the elimination of those which appear unprofitable. Societies on the same principle exist in Schleswig-Holstein, Brandenburg, the Rhine province, and elsewhere. In the former province there were in all fourteen societies, and ten of these, for which particulars were available, included 3,910 cows, belonging to 194 owners. In all, 82 of these Societies existed in Germany in 1904, the number of cows coming under control being 29,351.

Milking tests are, however, more common, and a system which has been undertaken in Bavaria since 1894 by the Allgauer Herd-Book Society bears some resemblance to the control system, though it is only intended to test the yield of the pure-bred cows in the herd-book. The cost is borne by the society, who employ several officers for the purpose. The milk of all the cows on the farms visited is weighed and recorded once a fortnight, and an average sample taken of the milk of each of the pure-bred cows. These samples are sent to the experiment station at Memmingen to be tested. Prizes based on the results are given, the production for this purpose being reckoned from eleven days after calving till the yield falls to 4½ lb. The daily average production per cow is calculated on the period between calving, including the dry period. The average results of a thousand cows in the eight years 1894–1902 were as follows :—

* April, 1905, p. 21.

——	Average.	Lowest.	Highest.
	Days.	Days.	Days.
Duration of milking	323	165	837
Dry period	65	—	203
Interval between calving	398	253	986
	Degrees.	Degrees.	Degrees.
Specific gravity of the milk ...	32·75	29·3	35·7
	Per cent.	Per cent.	Per cent.
Fat content	3·63	2·65	4·8
Fat in dry matter	28·36	22·23	31·12
YIELD IN 365 DAYS.	lb.	lb.	lb.
Milk	6,874	2,728	12,470
Fat	249	109	475
Dry matter free from fat	630	254	1,121

A milking test of a special character was carried out in 1896–97 by the Prussian Ministry of Agriculture. In this case the cows, which were North German low country cattle of various breeds, were tested on their own farms. Prizes were given for the best animals, which were afterwards exhibited at the Hamburg Show of the German Agricultural Society. The test lasted for a year, the cows being milked once a fortnight under the supervision of a responsible official, samples being taken and tested for fat. No restrictions were made as to feeding. The yield of fat by the cows which received the first prize in their respective breeds varied from 3·14 to 3·73 per cent. The total yields of milk obtained were exceptionally high.

In addition to the encouragement given by public and private bodies in the separate States and provinces, there are three large agricultural bodies which extend their operations beyond the political boundaries. These are the German Agricultural Society, the Berlin Fat Stock Show, and the German Dairy Union. Of the first of these societies a brief notice has already been given,* and apart from those branches of its work which in a general manner affect the live stock industry, it interests itself in cattle-breeding by annually holding a show in different parts of the Empire somewhat on the model of the English societies. The Berlin Fat Stock Show is also held annually. The Dairy Union aims at the promotion of dairying by holding a Dairy Exhibition, the distribution of literature, the appointment of instructors, the establishment of Dairy Experiment

* Journal, April, 1905. p. 55.

Stations, the education of dairymen, and the promotion of Dairy Co-operative Societies.

The influence of copper and copper salts on plant life has formed at different times the subject of many experiments. It was early known that copper in its soluble combinations was poisonous to the living cells both of the lower and higher plants, but in 1885 Millardet showed also that an insoluble or hardly soluble combination of copper, in the form known as the Bordeaux mixture, was an excellent fungicide—a discovery which was of special importance as affording a means of combating various injurious fungi on the leaves of cultivated plants. This, as is well known, is a mixture of sulphate of copper and calcium hydrate, which is distributed on the leaves in the form of a fine spray. Spraying of this kind has been observed under some circumstances to exercise a certain effect on the leaves and on the development of healthy plants, and in a lengthy article in the *Landwirtschaftliche Jahrbücher** Herr Richard Schander deals with the question in its different aspects, confining his attention, however, exclusively to the effect of the copper solution on the living plant and not on the fungi.

Investigations into the Effect of Copper Sulphate Solutions on Plants.

Bordeaux mixture has been considered by various investigators to exercise a beneficial influence in the following way : (1) the leaves appeared firmer, more robust and thicker ; (2) they were of a deeper green colour ; (3) the assimilation of the leaves was increased ; (4) the amount of transpiration was changed ; and (5) the duration of vegetation was lengthened. Other investigators, however, have arrived at a different conclusion, so far as general effect is concerned, and have showed that the Bordeaux mixture checked the development of the plant and resulted in a smaller yield.

By far the greater part of the experimenters attributed the effect of the Bordeaux mixture to the copper hydrate. According to one view the copper salts, without penetrating into the leaf, exercise a stimulating influence on the cells. Another view is that the smallest copper particles, partly with and partly without assistance from the cell sap, penetrate the cuticle

* Vol. XXXIII., 1904. Part 4—5.

and epidermis into the cells of the leaves and exercise a chemico-physiological stimulus on the protoplasm of the leaf-cells. Others, again, believe that the copper salts reaching the soil through the spraying are taken up by the roots and so affect favourably the development of the plant.

With regard to the first of these views Herr Schander regards the explanations given by its supporters as improbable. With regard to the second he states that it follows from experiments which have been made that the epidermis of the leaves is able to hinder the penetration of copper solutions, but that the copper, once penetrated, behaves in the same way towards the protoplasm of the leaf-cells as to the cells of algæ and fungi (referred to in the experiments quoted), and can injure the protoplasm even in such weak solutions as 1 to 100,000,000. It would appear, therefore, very hazardous to assume that the copper penetrates into the leaf and there exercises a beneficial influence.

The effect on plants of the copper left in the soil by spraying can never be beneficial. The author points out that in any case the effect must become apparent much later than the application of the solution, as it would be absorbed by the soil and could only reach the roots when washed out by rain. He considers, however, that it is proved by experiment that copper is injurious, and, moreover, that plants could only absorb a very small quantity of it without injury.

Among the other causes mentioned by the author which might have some effect are the action of the lime in the Bordeaux mixture and the effect of the spraying in preventing insect attacks, and, finally, the influence of the thin coating of copper on the assimilation and transpiration of the leaves. The latter point is one to which Herr Schander devotes considerable attention. He considers that the coating protects the chlorophyll against the prejudicial influence of intense sunshine and diminishes the transpiration of the leaves, thus explaining the beneficial effect which the application of Bordeaux mixture has frequently been observed to have on the leaves. No chemical action takes place, the result being entirely due to the modification in the intensity in the light produced by the thin coating of copper. In the case of the vine, the protection of

the leaves against the effects of excessive sunshine might be advantageous, and Herr Schander suggests that the strength of the Bordeaux mixture might be regulated according to the character of the season ; thus in a hot, dry summer a high percentage solution might be employed, while in a wet, dull year a 1 per cent. solution could be applied, which would still be sufficiently strong to destroy fungi.

There is one other point of considerable practical interest which is dealt with in this paper, and that is the cause of the occasional injury to leaves and fruit caused by copper solutions. Whilst observation has shown that this injury most frequently occurs with solutions containing too little lime, it may also happen when an excess of lime has been used ; the leaves of some plants are more easily affected than others, while the injurious effects appear to occur very irregularly and more in one year than another.

It would seem that lime is able to restrain, but not entirely to prevent, the injurious effect of the copper sulphate, and that the effect is more or less dependent on meteorological conditions, many cases of injury, for instance, occurring in the wet summer of 1902. In the case of peach leaves and apples, it would seem that the addition of quicklime in excess is by no means completely able to prevent injury, and against a too great excess of lime it must be remembered that the adhesibility of the solution to the leaves is thereby much diminished, whereas, so far as our knowledge goes at present, a solution is the more valuable the better and the longer it adheres to the leaf.

Moreover, the fungicidal effect of the solution depends simply and solely on its content of copper hydrate, and it operates only so long as it exists actually as a coating on the leaf. A too great excess of lime is necessarily associated with a reduction in the percentage of copper hydrate in the solution, so that its fungicidal effect is diminished. Thus we have no means entirely to prevent its virulent action, particularly in the case of peach and certain apple trees. Herr Schander's view is that peach trees should, if possible, not be sprayed at all—at any rate, never during rainy weather. If, however, it be done, it is imperative to use two parts of quicklime to one of copper sulphate.

In spraying vines, apples, pears, and potatoes, there is no reason to depart from the customary proportions, viz., one part of copper sulphate to one of quicklime. Injury only takes place in specially unfavourable years, and then it cannot be avoided. The employment of a solution giving an alkaline reaction is not considered advisable, on account of the more easy solubility of the copper hydrate in such a solution. Moreover, it is easier to mix the solution with equal portions of each component than to be obliged frequently to test for an alkaline reaction ; on the other hand, it may easily happen that a solution is used containing free copper sulphate.

In conclusion, Herr Schander observes that decidedly too much importance has been attached to the physiological influence of the coating of Bordeaux mixture on the green leaf ; the beneficial action of the copper on the higher plants was in no case observed in his experiments. In his opinion the Bordeaux mixture should only be used as a protection against fungi, though in certain cases one may usefully employ its power of affording protection from the sun to which reference has been made above.

Renewing Old Hedges.

With reference to the article on "Fences and Hedges" which appeared in this *Journal* (May, 1905), the Board have received the following interesting note from Mr. George Prentice, Strathore, Thornton, Fifeshire, one of their Honorary Agricultural Correspondents :—

"There is no doubt that hedges are the most expensive of all fences, and they are not planted except for amenity. Where they have been neglected and overgrown, it is sometimes the best and cheapest policy to renew them by judicious cutting, allowing three years' growth and laying over young shoots. In the article in question it is recommended that fences which have been cut over some years before should be cut and laid. The English system is to partly cut over these new shoots near the ground and lay them on the slant. In some experiments made by me in the renewing of old hedges, it has been found that shoots half cut through near the ground are apt to die off in our

damp and cold northern climate, but the following method of renewing irregular and overgrown hedges has proved successful:—

"If the fence is ultimately required to be 4 ft. high, the hedge would be cut clean across to a height of under 3 ft., any supple shoots being tied down to cover as many gaps as possible. This should be done with No. 18 galvanised wire, but care should be taken to tie down the shoots loosely, so as to allow for growth. As the hedge is only cut to a little under 3 ft., it is not necessary to keep the roots of the hedge clean otherwise than by cutting the long weeds that might grow up through the naked hedge. In this state the hedge would be left for three years, when it would be switched up, leaving the top shoots. These shoots would be thinned to the required distance, and laid down and tied horizontally across the top of the hedge to cover all blanks. If this single process did not suffice to make a close fence, the hedge could be allowed to grow for the necessary time and the operation repeated. The hedge after laying would be perfectly close, and could be kept trimmed every year or every second year according to taste.

"The fences referred to above are on arable land under rotation and grazed for two or three years. As the lands are in crop for five or six years, the operation referred to is commenced when the grass is broken up, and by the time the land comes into pasture again the operation ought to be finished, leaving a suitable fence for stock. It is not, therefore, necessary to protect the hedge against stock during the process of renewal."

Notes on Foreign Crop Prospects.

France.—The approximate results of the harvest of wheat, rye, and mixed corn for 1905 were published by the Ministry of Agriculture in the *Journal Officiel* of the 26th September. The crop of wheat is estimated at 328,314,687 bushels on an area of 15,976,321 acres, an average of 20½ bushels per acre. The comparative figures for 1904 showed that 16,126,378 acres produced 289,590,331 bushels; in 1903 a total yield of 353,060,208 bushels was obtained from 16,002,458 acres. The average wheat production for the ten years 1895–96 to 1904–05 has been 318,076,495 bushels, and the net importation 15,663,007 bushels, giving an average consumption

of 333,739,500 bushels. The estimated production of the past harvest is, it will be seen, nearly equal to the average consumption.

The production of mixed corn is not important, the total yield only amounting to 7,015,338 bushels, while that of rye was 58,404,261 bushels, compared with an average of 53,221,387 bushels during the five years 1900-04.

Germany.—The official Report on the crops in Germany in the middle of September deals only with potatoes, clover, lucerne, and grass. The condition of potatoes has fallen off a point since the preceding Report, and it is stated that the prospects of a good crop have gone back somewhat in consequence of the wet. The earlier and better sorts, the harvesting of which had commenced, showed disease and rot to some extent, so that the somewhat sanguine expectations respecting this crop may not be fulfilled. The later sorts seem up to the present to be still sound.

According to preliminary figures published by the Statistical Bureau, the area under cultivation in the German Empire in June, 1905, was as follows :—

	1905.	1904.
	Acres.	Acres.
Wheat	4,759,994	4,736,257
Rye	15,179,788	15,065,197
Oats	10,329,668	10,348,512
Barley	4,034,076	4,018,883
Potatoes	8,191,985	8,121,017

According to the preliminary data published by the Central Statistical Committee on September 14th, the yields of 1905 compare with those of the preceding year and with 1899-1903 as follows :—

	Average 1899-1903.	1904.	1905.
	Qrs.	Qrs.	Qrs.
Winter Rye	99,322,500	120,510,000	74,310,000
Winter Wheat	22,477,500	25,642,500	24,360,000
Spring Wheat	34,927,500	51,900,000	34,740,000
Barley	27,307,500	33,862,500	27,705,000
Oats	52,267,500	70,785,000	49,072,500

Canada.—Lord Strathcona, the High Commissioner for Canada, received a telegraphic message on the 25th September from the Department of the Interior at Ottawa stating that there

is a general agreement to the fact that Western Canada has never had a better crop than the present one. The Dominion Government Grain Commissioner reports that there never has been in the history of Canada a crop of finer and more uniform quality, and that as much as 80 per cent. of it will grade No. 1 Northern.

United States.—The October Crop Report published by the United States Department of Agriculture, as reported in *The Times*, shows that the average condition of maize on 1st October was 89·2, as compared with 83·9 on the same date in 1904, and 80·8 in 1903. The preliminary estimate of the yield per acre of spring wheat is 14·7 bushels, as against 12·7 bushels in 1904, and 14·4 bushels in the two preceding years. With regard to oats, the preliminary returns indicate a crop of about 939,332,000 bushels, or an average of 33·9 bushels per acre. Last year the total yield was 894,596,000 bushels. The preliminary estimate of the yield of barley is 26·7 bushels per acre as against 27·2 last year.

Produce of Hops.

The Board of Agriculture have issued the following preliminary statement showing the estimated total production of hops in the years 1905 and 1904, with the acreage and estimated average yield per statute acre in each county of England in which hops were grown.

Counties, &c.	Estimated Total Produce,		Acreage Returned on 5th June.		Estimated Average Yield per Acre.	
	1905.	1904.	1905.	1904.	1905.	1904.
	Cwts.	Cwts.	Acres.	Acres.	Cwts.	Cwts.
Kent ... East ...	135,945	74,878	10,417	10,272	13·05	7·29
Kent ... Mid ...	152,044	82,795	10,464	10,283	14·53	8·05
Kent ... Weald ...	155,481	59,134	9,774	9,286	15·91	6·37
Total, Kent	443,470	216,807	30,655	29,841	14·47	7·27
Hants	30,207	9,137	1,978	1,900	15·27	4·81
Hereford	88,802	14,101	6,851	6,767	12·96	2·08
Salop	1,626	280	135	140	12·04	2·00
Surrey	10,248	2,515	843	877	12·16	2·87
Sussex	69,059	27,726	4,647	4,474	14·86	6·20
Worcester	51,961	11,736	3,807	3,752	13·65	3·13
Other Counties* ...	570	28	51	48	11·18	0·58
Total	695,943	282,330	48,967	47,799	14·21	5·91

* Gloucester and Suffolk.

Exportation of Maize from Roumania.

The Board are informed through the Foreign Office that owing to the partial failure of this year's maize crop in Roumania, following on the unprecedentedly small crop of last year, it has been decided to continue the prohibition of the export of maize after the 15th October next (the date on which the prohibition would otherwise expire), until further notice. Large quantities of maize were imported in the autumn from Argentina and elsewhere, and it is considered unlikely that the proceeds of this year's crop will suffice for local requirements. A note as to the prohibition of last year appeared in this *Journal* in August, 1904, Vol. XI., p. 277.

The Vapourer Moth.
(*Orgyia Antiqua.*)

The caterpillars of this moth have been very destructive in several parts of the country this season; they feed on many species of fruit and garden trees and on shrubs, *e.g.*, the laurel and the *Mahonia Aquifolium.*

In September and October the males of the *Orgyia antiqua*, with their tawny wings, may often be seen flying about the streets of London. The moth is found in Britain as far north as Sutherland, and is common in Ireland, mainly in gardens. There is a Continental record of an infestation in the year 1828, when damage was done by the caterpillars in woods over an extent of 3,706 acres.

The Moth.—Fore wings of the male ochreous-brown, posteriorly darker orange-brown; lines dark fuscous, first indistinct, second strongly curved outwards on upper half; a conspicuous clear white spot shows near the hinder angle of each fore wing. Hind wings deep brownish-orange. The wing expanse is from one to one and a quarter inches. The female is yellowish-grey and has rudimentary wings and pectinate antennæ.

The larva, which is $1\frac{1}{4}$ in. to 2 in. in length when full grown is ash coloured, striped with reddish-yellow and white, and red-spotted; a characteristic of this caterpillar is the presence of large tufts of yellowish hair on the back in segments 5 to 8, and

of tufts of dark or black hair on each side of the head and of segment 5, whilst there is also one at the tail.

The chrysalis, which is hairy, is enclosed in a yellowish-grey and somewhat oval cocoon.

Life History.—The female moths never move far from the cocoons out of which they have crawled, often laying their eggs on the outer sides of the silken webs, and there they remain to die. The clusters of eggs may be found in abundance during the winter

INJURY CAUSED BY CATERPILLARS OF THE VAPOURER MOTH.

months, the caterpillars hatching out from these eggs towards the end of April. When fully grown the larva spins a web on the bark of a tree, or in any other convenient place, and changes to a hairy chrysalis, the moth appearing in summer in about a fortnight. Wherever an attack has occurred this season, if nothing is done to check it a greater infestation may appear in the same locality next season owing to the females being unable to leave the vicinity.

Prevention and Remedies.—1. All the webs that are observed should be collected and burnt, and these may be found on walls and fences, as well as on bushes and trees.

2. As soon as the caterpillars are noticed to attack the leafage in spring the bushes or trees should be sprayed with Paris green, in the proportion of 1 lb. of Paris green, to 200 gallons of water; in autumn double that strength should be used. As Paris green is not a solution but a mixture, it must be kept constantly stirred as it is used. Lead arsenate is an alternative spray.

WM. FORBES.

Importation of Canadian Cattle into the United Kingdom.

Copies of correspondence which has passed between the Governor-General of Canada respecting the importation of Canadian cattle into the United Kingdom and the Secretary of State for the Colonies have recently been published as a Parliamentary Paper. [Cd. 2715.]

The Despatch of the Governor-General contained copies of the following extract from the Minutes of Proceedings of the Senate of Canada, dated the 6th April, 1905.

"*Resolved.*—That the Senate of Canada desires to call the attention of the Imperial Government to the fact that Canadian herds are now, and have been for many years past, free from those particular diseases against which the embargo has been imposed.

"That this has been repeatedly admitted by the Imperial authorities themselves.

"That under these circumstances, the continued prohibition of the importation of Canadian cattle on the pretext that there is danger of the spread of those particular diseases among the British herds, is an unjust imputation on the condition of Canadian cattle, and the Senate of Canada respectfully suggests that the Imperial Act based thereon should be repealed. And that a copy of this resolution be transmitted to the Right Honourable the Premier of England and to the Right Honourable the President of the Board of Agriculture."

In reply, Mr. Lyttelton transmitted an extract, which is reproduced below, from a letter from the Board of Agriculture, and stated that "His Majesty's Government have given the fullest consideration to the representations made to them on this subject, but much regret that they feel themselves unable to propose to Parliament any amendment of the existing law."

Board of Agriculture and Fisheries,
4, Whitehall Place, London, S.W.,
August 1st, 1905.

[EXTRACT.]

Experience has shown that the existing statutory requirement that all cattle imported into this country shall be slaughtered in wharves provided for the purpose at the port of landing is no

obstacle to the development and maintenance of a large and valuable trade. In the case of Argentina, the number of cattle imported into Great Britain steadily rose from 4,200 in 1891 to 85,000 in 1899, when the trade was interrupted by the introduction of foot-and-mouth disease in that country. The value of the imports in question was £68,000 in 1891 and £1,392,000 in 1899. During the whole of that period the requirement of slaughter was in force. The case of the United States shows similar results. The number of cattle imported in 1879 was 76,000, with a value of £1,782,000. In 1904 the number imported was 401,000, with a value of £7,160,000. Slaughter at the port of landing was required for the first time in 1879, and has been enforced ever since. The Board are glad to observe that similar results are indicated in the case of Canada. The imports during the past two years have been as follows :—

——	No. of Cattle Imported.	Declared Value.
		£
1903	190,812	3,315,762
1904	146,598	2,547,451

The highest figure recorded prior to 1892, when slaughter at the port of landing was first required, was in 1890. The imports in that year were 120,469, with a declared value of £1,892,298.

The existing law does not cast any stigma or discredit upon Canadian cattle, for it holds good not only in the case of the United States and other foreign countries, but also in that of every British Colony, including both Australia and New Zealand, whence live cattle have in the past been imported into Great Britain. It is in fact a sanitary law of universal application, of great importance to stock-owners at home as a valuable safeguard against the introduction of disease, but not at all inconsistent with the transaction of a large and growing trade, as has already been shown.

The experience of Argentina in 1900, and more recently of the United States in 1902, has shown how suddenly and unexpectedly foot-and-mouth disease may make its appearance in

a country, quite irrespective of the maintenance of an efficient veterinary organisation. In the former case diseased animals were actually imported into this country, and it was only by dint of good fortune and the most strenuous exertions that the infection was kept within the limits of the Foreign Animals Wharves. A similar result might well have happened in 1902 in the case of the United States, notwithstanding the ability and the energy of the Department of Agriculture in that country.

The enormous losses which British agriculturists have suffered during the last thirty years, mainly by reason of the increased pressure of Colonial and foreign competition, make it more than ever necessary that every possible precaution should be taken against the introduction of disease, consistent with the reasonable requirements of Colonial producers and the interests of consumers at home. The consequences of the recurrence in Great Britain of epidemics of disease, such as have been experienced in the past, would now be disastrous, and consumers as well as producers would be affected throughout the country. It is therefore in the general interest that no risk should be taken which can be avoided by the maintenance of a law which provides a considerable measure of security against the introduction of disease, and at the same time does so without any serious stoppage of trade and without rendering it necessary for any action of an invidious character to be taken in regard to the cattle imported from a particular Colony or country.

Importation of Live Stock.— Argentina.

The Board have received through the Foreign Office a copy and translation of a Decree, dated 18th August, 1905, permitting under certain conditions vessels conveying live stock to the Argentine Republic to call at ports whence the importation of live stock is prohibited. This decision is of some importance to exporters of pedigree stock in the United Kingdom, as the trade is at present chiefly carried on by Liverpool steamers sailing direct.

The Decree cancels the sub-head of Article 48 of the General

Sanitary Regulations (Animals), which lays down that vessels which have shipped live stock in a country from which its importation is permitted into the Republic, may not enter or afterwards call at any port or place in countries from which similar importation is prohibited, and provides that vessels which may have shipped live stock in a country from which its importation is permitted into the Republic may afterwards enter or touch at any port of another country or countries in the voyage, wherein the sanitary state of animals is in a satisfactory condition, with the sole object of embarking passengers.

A summary of the General Regulations was given in this *Journal*, Vol. XI., p. 615, Jan., 1905; and of a Decree as to pedigree stock in Vol. XII., p. 55, April, 1905.

Importation of Live Stock.—Uruguay.*

According to the Decree of January 29th, 1903, the regulations governing the importation of horses, cattle, sheep, and pigs into Uruguay are as follows:—The importation or landing of animals proceeding from a country where cattle-plague, pleuro-pneumonia, foot-and-mouth disease, sheep-pox, or any other disease prevails which might endanger the health of live stock in Uruguay is prohibited. The importation of live stock proceeding originally from a country against which the Uruguayan ports are closed is prohibited, as is also the transport of live stock in a ship which within thirty days has conveyed animals from an infected country, or which has been in contact with animals from a prohibited country, or touched at a port of such a country. Entrance is prohibited into Uruguayan ports of any ship which within sixty days has shipped animals of any description and for any port, if such animals proceeded from a country included in the prohibited class on account of the existence of cattle-plague, or carrying live stock proceeding from any prohibited country. The importation of live stock from countries beyond the seas must take place through the port of Montevideo.

* Live stock import regulations have been published in this *Journal* for the following countries: Transvaal, March, 1903; United States, June, 1903, and Oct., 1904; Argentine, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, August, 1905; and Belgium, Sept., 1905.

When live stock is to be imported, the authorities are to demand from the owners or importers a written declaration that the animals have been shipped in accordance with the above requirements.

A certificate issued by the Ministry of Agriculture, or by the Department representing the same, of the country of origin, and viséd by the Consul there residing, must also be presented to the effect that:—

(*a*) The animals have been submitted to a veterinary inspection at the place of shipment in order to prove the good state of their health, and that they, as well as the lighters or other means of conveyance employed for placing them on board, were previously subjected to such hygienic measures as are adapted in the country of origin so as to guard animals against contagion:

(*b*) Importers must also exhibit a form specifying the number, species, and breed of the animals shipped, and the address of the owners and the destination of the animals:

(*c*) In the case of cattle the certificate must also indicate that in the country of origin cattle-plague does not exist and has not existed for the last ten years, and that foot-and-mouth disease and pleuro-pneumonia do not exist and have not existed there for the last six months.

(*d*) In the case of sheep the certificate must make a similar statement as to cattle-plague and foot-and-mouth disease, and further, that sheep-pox of an epizootic character does not exist in the province or department from which the sheep come and that no case of that disease has occurred for six months.

(*e*) In the case of goats or swine the certificate must make a similar statement as to cattle-plague and foot-and-mouth disease as in the case of cattle.

(*f*) When horses are transported the certificate must make a similar statement as to cattle-plague, and also that neither glanders nor farcy of an epizootic nature exists, and that in the province or department whence the animals come there has been no case of these diseases for the last six months.

(*g*) Consuls when legalising the signature of these documents must also certify that the official who issues them is competent and authorised so to do.

The following regulations apply on the arrival of the live stock:—

1. If the existence of cattle-plague on board be proved or suspected, the vessel, live stock, and cargo will be turned back.

2. Should the existence of pleuro-pneumonia, foot-and-mouth disease, glanders, or sheep-pox be ascertained or suspected, or should any cases of these diseases occur during the voyage, the importation of all sick animals is to be absolutely prohibited, as well as any animals belonging to species likely to contract or transmit the disease.

3. Should animals be found on board suffering from anthrax, swine-fever, pneumo-enteritis of swine, equine syphilis, or rabies, their disembarkation shall be prohibited, or they may be quarantined for as long as may be necessary.

4. Animals with scab or with any parasitic complaint, or suffering from any contagious disease not mentioned above, if they are not rejected altogether, may be admitted to quarantine, or they may be slaughtered without compensation, unless they are re-shipped within a specified time.

In cases not included in the foregoing articles animals may be submitted to the following restrictive measures:—

(*a*) Cattle may be subjected to quarantine for forty days, and inoculated with tuberculin, if they react, orders will be given for the immediate slaughter of the animals (without compensation) or for their re-embarkation within eight days.

(*b*) Sheep shall be kept in quarantine and isolated for fifteen days.

(*c*) Horses will be submitted to eight days' quarantine, and at the end of this term they may be inoculated with mallein, and such as react, or such as may have been in contact directly or indirectly with horses suffering from glanders, shall be immediately slaughtered without compensation.

Any animals which are attacked by contagious disease while in quarantine will be slaughtered without compensation, unless the owner re-exports them within eight days.

Special regulations govern the importation of live stock from the Argentine Republic.

Importation of Live Stock into the Bahamas.

The Board of Trade have received from the Colonial Secretary of the Bahamas a copy of the "Tariff Amendment (Breeds Improvement) Act, 1905" (No. 6 of 1905), which was assented to by the Governor on 18th April last, with a view to the improvement of breeds of live stock in the Colony.

The present Act provides that, notwithstanding the provisions of the Tariff Acts, 1895 to 1900, all stallions, bulls, rams, and poultry may, from the above date, be imported free of duty into the Bahama Islands.

Swine Erysipelas.

The symptoms of the contagious disease of swine caused by the bacillus of swine erysipelas are as follows:—

In acute cases the swine show the usual signs of severe illness in the pig, viz., rise of temperature, shivering, loss of appetite, and vomiting. In such cases a fatal termination may take place in twenty-four to forty-eight hours, but frequently the animals live much longer. In the less acute cases a red patchy eruption from which the disease gets its name—Erysipelas—appears on the buttocks, thighs, body, and ears.

The breathing is very quick, and the swine stagger about when made to walk. Ultimately they lie prostrate in the litter and die comatosed.

In mild cases the general symptoms are not marked; the swine appear to be out of sorts, and show the usual skin eruption.

Animals which have apparently passed through the acute stages of the disease may remain unthrifty for a long time. Sometimes they die suddenly from disease of the heart, which is not an uncommon sequel of the disease. In other cases they present symptoms of lameness, due to trouble in the joints.

The skin is discoloured by livid patches, as in swine fever, but sometimes the only symptoms shown are those of nettle-rash. The bacillus, apparently, can flourish for a long time outside the bodies of animals, so that once the disease is introduced into insanitary sties the infection tends to remain there. For some reason, however, which is ill understood, the disease may assume

a very mild form for a time, then burst out acutely. In Great Britain the acute forms have been observed particularly in the warm months.

Post-mortem.—The membranes of the stomach and intestines show red patches and are often swollen. The intestinal glands on the membrane are red and enlarged; sometimes the surface over these glands is abraded, but the distinct ulcer of swine fever is never seen. The lymphatic glands throughout the body are swollen and red. The spleen is often enlarged.

The membraneous coverings of the lungs and heart show red spots, and sometimes fluid is present in the chest and heart sack. The lungs are congested.

In the chronic form one often finds that the tissues around the opening between the chambers of the heart, particularly on the left side, are thickened and rough; that is to say, endocarditis is present.

Prevention.—This is a disease against which several methods of protective inoculation have been directed. As far back as 1882, Pasteur and Thuillier prepared an attenuated virus by passing the microbe in series through rabbits. Two vaccines of different strengths were employed with an interval of twelve days. The inoculations are made under the skin inside the thighs at the dose of one-eighth c.c. The immunity takes about a month to establish itself, which is, of course, a serious objection to the method. It is advised that the operations should be as far as possible performed on pigs under four months, as they present more resistance. The immunity is said to last about a year. This is sufficient for feeding purposes, but it means that the inoculation requires to be performed annually on animals kept for breeding. The method has many serious disadvantages. It may give rise to fatalities. The statistics from Hungary, collected on about 4,000,000 observations, put these at 1·68 per cent., against a calculated death-rate of 20 per cent. in the non-vaccinated.

In France, however, the results have not been so happy. In certain cases a loss of 10 per cent. has been recorded, in addition to such sequelæ as arthritis, (inflammation of the joints), and emaciation. The high percentage of losses is said to take place only in districts where the disease is established,

but these, unfortunately, are the very places where one would wish to employ inoculation.

Lorenz, recognising the shortcomings of the method, devised another in 1863. This consisted in the preparation of a serum by injecting protected pigs with large doses of cultures. The pig, however, is not a good subject for the preparation of serum. In order to get sufficiently active material the immunising bodies had to be precipitated by sulphate of ammonia. At the seventh International Veterinary Congress, Lorenz, in common with Leclainche and others, admitted that the horse was best suited for the preparation of a serum against swine erysipelas. A horse can be prepared in about two months. The immunity conferred by the serum alone begins immediately, but it lasts for little more than ten days. It apparently has protective properties even when used in the initial stages of infection.

Leclainche advises that where the disease has already broken out the pigs should receive a preliminary injection of serum, 10—20 c.c., according to weight. This, he says, greatly reduces the number of accidents consecutive to vaccination proper, which is performed about ten days afterwards. The first operation is with a mixture (made on the spot) of serum—1 c.c. per 20 lb. live weight with a minimum of 5 c.c. and a maximum of 10 c.c., and ·8 c.c., of a culture. Twelve days later the animals receive ·8 c.c., of a culture without any serum. The injections are made subcutaneously either at the base of the ears or inside the thighs. During a period of eighteen months ending November, 1901, over 24,000 pigs were thus inoculated without accident. About one-half of them were treated by preliminary injection of serum.

In the first method of Lorenz serum was administered three days or so before the culture, which was made with somewhat attenuated bacilli obtained from the chronic lesions. This was followed twelve days afterwards by a double quantity of culture. Later, Lorenz combined the injection of serum and first vaccine, but inoculated them at different parts of the body. In 1898, 22,161 pigs were inoculated by Lorenz's method in Eastern Prussia, of which 3,831 were on infected farms. In the latter there were no fresh cases of swine erysipelas after inoculation; 58 per cent. of recoveries were recorded in sick animals after

the injection of serum (alone) (1—4 doses). Nettle-rash occurred in ·04 per cent. of the inoculated ; the disease disappeared from the farms after inoculation was adopted, whereas it had reappeared regularly before that time.

In Wurtemburg in 1896—8, 17,758 pigs were inoculated. The accidents numbered thirteen ; the deaths certified due to this disease (*i.e.*, failures to protect) were sixteen (ten cases doubtful) ; 3,254 non-vaccinated died of swine erysipelas.

It is not advisable to resort to inoculation of pigs on non-infected premises unless the circumstances are such that owing to the proximity of acute outbreaks it appears practically impossible to prevent the disease being introduced by methods of rigorous isolation, because the operation might possibly be the means of infecting the premises. Should the disease appear, however, all the pigs should with the least delay possible receive a dose of serum, and those in which the temperature is normal should be removed to non-infected sties on the same premises, if this be practicable. Ten days afterwards the vaccination proper may be practised after the method of Leclainche (serum and virus, then virus alone) on those animals still showing a normal temperature. The pigs with high temperatures should be returned to the infected sties, and if their value warrants it, they should be treated by injections of serum alone. On no account should they receive the culture. If it be found impossible to separate the sick from the healthy, the operations should be carried on in the infected sties. Although this disease can to a large extent be successfully combated by sero-therapy, it must not be thought that measures of isolation and sanitation can be dispensed with. While the outbreak lasts, no new pigs should be brought in, and none should leave the premises, except for slaughter, under the most rigorous precautions against the disease being conveyed to other premises. If a pig owner finds that the disease reappears annually on his premises he should resort annually to preventive inoculation, timing the operation so as to have his animals immunised before the season of greatest activity. He should also remember that the complete eradication of the disease from his premises will be greatly facilitated by keeping his pigs in sties which can be properly disinfected.

Epizootic Lymphangitis is a contagious and eruptive disease, caused by the *Cryptococcus farciminosus.* Horses and mules are affected; the ox is also susceptible, but seldom takes the disease under natural conditions.

Epizootic Lymphangitis.

Symptoms.—The eruption appears on the legs, the neck, the head, or any part of the body. Usually it starts near a wound through which the microbe has entered the tissues, but the ulcers often do not appear for months after the wound has healed. The lymph vessels in the skin stand out prominently, and small hard nodules about the size of a hazel-nut appear on their course. These nodules suppurate and discharge a thick yellowish pus. Proud flesh grows from the wounds, the lymph vessels around become inflamed, and the eruption gradually extends. A thick yellow scab may form over a patch of ulcers. The neighbouring glands are swollen and hard. The ulcers heal with difficulty, even under treatment, and they may break out again after an apparent cure has been effected.

The ulcers may appear inside the nostrils, but this is not nearly so common as in the case of glanders. In epizootic lymphangitis the glands under the jaw may also be enlarged, as in the former disease, and a discharge may appear at one or both nostrils. If taken in the early stages this disease is curable, but after an advanced stage is reached, treatment is hopeless. In the latter case the animals emaciate, and may die of exhaustion.

This disease is distinguished from farcy (glanders) by the presence of the *Cryptococcus* in the pus, and failure of the mallein test to produce a reaction. Both glanders and epizootic lymphangitis may be present in the same animal.

On *post-mortem* examination one usually sees little beyond what is seen during life, but occasionally abscesses are found in the internal organs.

Two instances have recently come before the Board in which the death of cattle has been attributed to the poisonous effects of *Cupressus macrocarpa* and *C. nootkatensis.* In one case four bullocks died, and on the internal organs being forwarded by the owner to the Royal Veterinary College, Professor McFadyean reported that from the inflamed con-

Alleged Poisonous Properties of *Cupressus.*

dition of the fourth stomach and from the description of the symptoms he had little doubt that the cause of death was irritant poison. Some pieces of *Cupressus macrocarpa* were found in their stomachs, and in default of any other explanation it was suggested that this plant might have some poisonous properties.

In another case three heifers are stated to have suffered from irritant poison; one of them died, but the other two recovered on removal to another field. The veterinary surgeon in this case also attributed the death to a *Cupressus* (*C. nootkatensis*) growing by the side of the field.

The Board have no information as to the poisonous properties of these two species, nor can any record be found of any similar case which would tend to confirm the suspicion that they are poisonous to cattle.

Pasteurised Milk.

The Board have received through the Foreign Office a translation of an article by Dr. Ostertag, which appeared in the *Danish Monthly Review for Veterinary Surgeons* for August, dealing with the question of pasteurised milk. Dr. Ostertag observes that in the course of the last fifteen years it has been repeatedly proposed in Germany that a law should be passed prescribing that all milk sold for human consumption should be pasteurised. Against this proposal it was at first objected that it would be impossible to carry it out, and, subsequently, as our knowledge of the bacteriological and chemical properties of milk has become more extensive, other objections of a sanitary nature have been brought forward. It is now believed that if milk is heated for pasteurisation in the ordinary way, its condition becomes so much altered that instead of being an article of nourishment it may become a source of danger; and Dr. Ostertag adds that he does not believe there exists at the present time any expert who will recommend a general obligation for the heating of all milk offered for sale; on the contrary, efforts are now generally directed to producing the milk under such conditions that it may without fear be consumed

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raw even by infants. Dr. Ostertag, in the article above-mentioned, goes on to discuss some of the dangers which, in his opinion, may arise from the unrestricted sale of pasteurised milk.

Danish Margarine Law.

The law relating to the manufacture and sale of margarine in Denmark has recently been amended by a supplementary Act, dated the 23rd June, 1905, providing for the "ear-marking" of Danish margarine by the addition of some indicative substance.

Article 1 provides that margarine and margarine cheese shall contain a substance which is easily distinguished by chemical means, and which does not affect the nature or colour of the margarine or margarine cheese. It is forbidden to manufacture, import, export, convey in transit, or deal in margarine or margarine cheese which does not fulfil the conditions of this law.

Regulations have since been issued by the Ministry of Agriculture prescribing the measures to be taken to carry out the law. It is ordered that margarine and margarine cheese are to contain sesame oil to such an amount that the fat in margarine and margarine cheese will react in the manner described in the second section of the Regulations. This amount corresponds to about 10 per cent. of sesame oil in margarine, and about 5 per cent. in margarine cheese.

The law comes into force on the 1st January, 1906.

Investigations into Camembert Cheese.

The primary difference between the hard and soft cheeses is due to different methods of manipulation of the curdled milk. In the hard cheeses (Cheddar, Edam, &c.) the milk is curdled rather rapidly and the curdled mass subsequently cut into small pieces to allow much of the whey to separate from the curd. After this the curd is placed in shapes and subjected to a high pressure that forces out more of the whey, leaving a very hard mass of tolerably dry curd. Such a curd ripens slowly, and is not ready for market for some

months, and even when perfectly ripe it preserves its form, and never becomes very soft.

The soft cheeses (Camembert, Brie, Limburger, Neufchatel, cream cheeses &c.), although each kind is made in a special manner, all agree in one point, namely, the whey is never fully drained from them. The curdled milk is commonly ladled into shapes and allowed to drain naturally. Soft cheeses are not subjected to pressure or heat, and therefore contain a larger percentage of water at the start than the hard cheeses. As a consequence of their high water content and soft texture, they afford favourable conditions for the growth of various micro-organisms, and enzyme action also occurs more readily than in hard cheeses. The details of the process of ripening and the chemical and other changes involved are but little understood, and a series of investigations into these and other points connected with soft-cheese making have been undertaken in America by the Storrs' Experiment Station in conjunction with the United States Department of Agriculture. The Camembert cheese was selected first, and a preliminary bulletin has now been published dealing more particularly with the scientific questions involved.

An examination was made of a number of moulds found on Camembert cheese, and it was shown by pure-culture experiments that the Camembert mould (*Penicillium candidum*?) is not only capable of changing the acidity of the curd, but is able also to cause such changes of the curd as will account for the texture of the ripe cheese, and that this result is due to the secretion of an enzyme. A cheese ripened by this mould alone is white, soft, creamy, and quite palatable, but wanting in colour and lacking the peculiar flavour of true Camembert cheese. After repeated tests had shown the same result, another organism was sought for capable of producing the desired flavour. Among the fungi met with on Camembert cheese is the well-known *Oïdium lactis*, and it was found that the inoculation of this organism upon cheese partially ripe and lacking flavour would lead to the production of the flavour distinctly in a very few days. From its habits of growth the development of this mould upon cheese is nearly always accompanied by a rapid multiplication of bacteria, and a final conclusion as to whether or not *Oïdium lactis* alone produces the flavour must

be deferred until an exhaustive test has been made of those bacteria which are so constantly associated with it. It is considered, however, that there is good circumstantial evidence for considering that *Oïdium* has some function in producing flavour.

The practical problem, therefore, which is suggested by these investigations, is the discovery of a method which will enable the cheese-maker to control the growth of micro-organisms, more especially the lactic bacteria and these two species of moulds. The control of the process of souring of the curd is very easy. It is only necessary to apply here the method used in cream ripening—viz., the inoculation of the milk with lactic starters. These starters, if placed in fresh milk, ensure a proper souring with perfect uniformity.

The control of mould growth is a more difficult matter, because of the great likelihood that the cheeses in handling will become inoculated on the surface with other than the desired organisms. The solution of the problem, however, appears to be found in proper attention to three factors: (1) the inoculation of the cheese at the proper stage with a comparatively large quantity of the spores of the desired organisms; (2) the cleanliness of the ripening cellar; and (3) the treatment of the cheese in the cellar. The attention of the staff which is engaged in carrying out the investigations is now being directed to these points, and it is stated that a bulletin will be published by the United States Department of Agriculture giving in detail the actual methods of making and handling which have been found most successful in producing the best product.

Manuring of Apple Trees.

In the spring of 1901 an experiment in the manuring of fruit trees was undertaken in Germany to test the effect of various artificial manures, and the results form the subject of a report by Dr. Clausen in the *Landwirtschaftliche Jahrbücher* for 1904 (Part 6). An orchard, which had been planted in 1900 with several hundred trees, afforded an opportunity to experiment with a number of apple trees of the same age and variety, and 81 half-standards of "Baumann's

Reinette" and the same number of "Schöner von Boskoop" were selected. The soil was a light sandy one, and was, prior to planting, manured with 16 cwt. of basic slag, 19 cwt. kainit, and 24 cwt. of lime per acre, while, in addition, it received an application of farmyard manure. The fact that the orchard was so heavily manured before the experiment was begun may, it is thought, have affected the trials, but the results are, perhaps, worth noting.

The 81 trees were planted in three rows, and as nine methods of manuring were to be tested, a different manure was applied to each cross row of three; the results from the nine trees similarly manured were therefore obtained from three different parts of the orchard, any variations due to the soil being thus minimised.

Some of the points dealt with in the experiment may be summarised as follows:—

Kainit and basic slag applied to the trees at the beginning of April in quantities of about $2\frac{1}{4}$ lb. each per tree, proved injurious to such an extent that it was still noticeable three years afterwards. As stated above, this result was obtained on land previously heavily manured with mineral matter. It is possible that this result might be prevented if the manure were applied during the winter, and the fact that manure applied at the beginning of March in small quantities in the second and third year gave a favourable result, seems to support this view. Chalk marl in quantities of $2\frac{1}{4}$ lb. per tree had a useful effect, notwithstanding the fact that the soil was already well furnished with lime. It was observed that in several instances the lime diminished the injurious effect of the over-manuring with kainit and basic slag.

The addition of nitrogenous manures acted in the same way as the lime, and the application of $2\frac{1}{2}$ oz. per tree of sulphate of ammonia promoted the growth of wood. The latter manure was also found to be much superior to nitrate of soda. The after effect of the nitrogenous manures was distinctly noticeable in the second year.

In connection with the above experiment, it may be remembered that in the trials continued over nine years at the Woburn Experimental Fruit Farm, it was found that neither moderate nor heavy dressings of dung or artificials, nor of both combined,

had any appreciable effect on any feature of the trees, nor on the crops from them. The total effect did not amount to 5 per cent., and even that effect was very doubtful. The only exception was in the case of nitrate applied in the early or late summer, which in several seasons produced a good effect.

In the tenth year (1904) the highly-manured plots showed an excess of 3 per cent, and the deficiently-manured ones a deficit of 8 per cent. By the addition of these figures to the nine years' record, the average result for the ten years shows that the highly-dressed plots gave a slight excess of ·5 per cent. over the nornal plots, and the under-dressed plots a deficiency of 2 per cent. The most, however, that can be said from these results is that the indications are in favour of the view that manures are at last beginning to show their effect. If so, during the next year or two it may be expected that this effect will become more apparent.

Ventilation of Poultry Houses.

Experiments have been recently carried out at the South-Eastern Agricultural College, Wye, on the relative efficiency of poultry houses with and without ground ventilation. In previous investigations it was found that in wooden houses, either resting on the ground or with floors and top ventilation, the air changes about four times per hour, and in order to keep the air pure each bird must have ten or more cubic feet of air space allotted to it. In a wooden house slightly raised off the ground, without a floor, the air was found to change about eight times an hour, so that less cubic air space would suffice, but it was thought that in this case the house must be draughty, and could not fail to be injurious to the birds.

In order to test the point two precisely similar houses were used, one of which contained five hens and a cock and the other ten hens and a cock. The birds were selected to be of as nearly equal merit as possible, and the conditions were in other respects identical. The house containing the smaller number of fowls was provided with a floor and designated No. 6; the other (No. 11) had its floor removed and was lifted three inches from the ground, thus securing a current of air from below upwards.

The experiment lasted from December 10th, 1904, till March 29th, 1905, and during that time the five hens in house No. 6 laid 194 eggs, an average of 38·8 per hen; while the ten hens in house No. 11 laid 285 eggs, an average of 28·5 per hen. It appears, then, that the hens in house No. 6 laid more eggs than those in No. 11, earning 4s. a head during the fifteen weeks in one case, as against 3s a head in the other—a result strongly in favour of No. 6.

There is no reason to believe that this result was due to any accidental causes; the difference in the two houses seems rather to be due to some fundamental factor, and Messrs. Robinson and Russell, by whom the experiments were carried out, having ascertained that there was practically no difference either in the purity or temperature of the air, suggest that the true explanation lies in the amount of heat lost by the birds. Air passing through the house and coming in contact with the warm body of the bird becomes heated and escapes, only to be replaced by cold air. Each particle of air as it passes robs the bird of some heat, causing the combustion of more food as fuel to maintain the necessary temperature of the body. As has been stated, the air changes eight times per hour in house No. 11, and only four times per hour in No. 6. The result is that each bird in the former house is robbed of its heat by twice as many air particles as in the latter, and must therefore use more of its food for the purpose of keeping up its temperature, and, of course, if the food is consumed in this way it is not available for the production of eggs.

The conclusion therefore arrived at is that, although the purity of the air may be maintained with a larger number of fowls in a house of the floorless type by ground ventilation, it is better for the birds and more profitable to the owner to give them ten cubic feet in a house provided with a floor or resting on the ground, than five cubic feet in a house with ground ventilation. If the house is of the type provided with wheels and ventilated from below, it is better, during the winter at any rate, to let it down on the ground. The full space prescribed above should, however, be given.

It is pointed out that it is absolutely essential to secure top ventilation. The houses as supplied by the makers to the

College were deficient in this respect, and holes had to be made in the eaves. In this way the amount of carbonic acid in the air was reduced from 30 to 9 parts in 10,000; the high proportion of carbonic acid had previously had an injurious effect on the eggs, which proved to be sterile from both houses. After this alteration had been made the eggs became normal.

Report of the Intelligence Division.*

This publication contains Dr. Somerville's Report for the year 1904 of proceedings under the Sale of Food and Drugs Acts, 1875 to 1899; the Merchandise Marks Acts, 1887 to 1894; the Fertilisers and Feeding Stuffs Act, 1893; and the Board of Agriculture Act, 1889 (Sec. 2, Subsection 3).

The administration of the Sale of Food and Drugs Acts, so far as they relate to agricultural produce, forms the subject of the first section of the Report, and reference is made to the numerous questions which have arisen during the year in connection with the methods of sampling adopted by local authorities and the operation of the warranty section of the Acts. An account is also given of the points which have been brought to the notice of the Board in connection with the Fertilisers and Feeding Stuffs Act.

The work of the Board under the third section of this Report, viz., the action taken under Section 2, Sub-section 3, of the Board of Agriculture Act, 1889, which authorises them to make such enquiries, experiments, and research, and to collect or aid in collecting such information as they may think important for the purpose of promoting agriculture and forestry, naturally covers a wide field. It includes the adulteration of seeds, the collection of information as to railway rates and railway transport, the organisation of agriculture, enquiries as to the effect of the wet weather of 1903 on diseases of sheep, the afforestation of catchment areas by local authorities, soil inoculation, the quality of wheat, the co-ordination of experiments, and the dissemination of information respecting insect and fungoid diseases of crops and trees.

* [Cd. 2637. Price 6d.]

Reference is made to the honorary agricultural correspondents who have been appointed with a view of bringing the Board into closer relationship with agriculturists. The appointment of these correspondents, it is pointed out, has been of considerable value to the Board, inasmuch as it has enabled them to acquire information on many matters of importance to agriculturists, and in some instances to take action for the redress of their grievances. Perhaps the machinery thus created for the benefit of the agricultural class has not so far been fully taken advantage of by those for whom it was chiefly intended, but it is to be expected that, as time goes on, this important body of correspondents will become more and more a vital force in the agricultural progress of the country.

The Report concludes with an account of the efforts made by the Board to bring such information as is likely to be of value to the notice of farmers by means of this *Journal*, as well as by a wide circulation of leaflets, of which no less than 1,342,000 were distributed in 1904.

During the course of the summer of 1904 arrangements were made for the publication of the first hundred of the Board's leaflets, bound in stiff boards, in a single volume, at 6d. a copy net, no charge being made for postage. Two editions of 1,500 and one of 2,000 were rapidly exhausted, and a fourth edition was in preparation at the end of the year. The sale of these volumes implies a further distribution of 500,000 leaflets, bringing the total issue for the year up to 1,842,000.

Recent Publications of the Board.

The Veterinary Officers of the Board, with the view of assisting Inspectors as well as stock-owners in Great Britain to detect diseases of animals, have prepared a description of the symptoms of cattle-plague, pleuro-pneumonia, foot-and-mouth disease, sheep-pox, sheep-scab, swine-fever, glanders (including farcy), rabies, anthrax, epizootic lymphangitis, and mange.

This pamphlet has been printed for distribution, and persons interested can obtain a copy on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.

ADDITIONS TO LIBRARY DURING SEPTEMBER.

Africa—

Cape of Good Hope.—Curators and Superintendents of Public Gardens. Reports to 30th June 1904. (34 pp.) 1905.

Australia—

Western Australia.—Statistical Register for 1902.

Queensland.—Government Statistician's Report on Agricultural and Pastoral Statistics for 1904. (57 pp.) 1905.

Austria-Hungary—

Die Sparkassen und die Erwerbs- und Wirtschafts-Genossenschaften in Steiermark, 1902. (95 pp.) 1905.

Denmark—

Annandale, N.—The Faroes and Iceland. (238 pp.) 1905.

Det Forstlige Forsøgsvæsen meddelelser udgivne ved Forsøgs-Kommissionen Hæfte I. (134 pp.) 1905.

Germany—

Jahresbericht über die Verbreitung von Tierseuchen im Deutschen Reiche. 1904. (72 + 215 pp.)

Garcke, A.—Illustrierte Flora von Deutschland. (795 pp.) 1903.

Mitscherlich, E. A.—Bodenkunde für Land- und Forstwirte. (364 pp.) 1905.

Nathusius, S. von.—Die Pferdezucht unter besonderer Berücksichtigung des betriebswirtschaftlichen Standpunktes. (228 pp.) 1902.

Great Britain—

Webster, W. B.—Book of Bee-keeping. (103 pp.)

Ridgeway, W.—The Origin and Influence of the Thoroughbred Horse. (538 pp.) 1905.

Aynsome Agricultural Station.—Report of Central Seed-Testing Laboratory. (53 pp.) 1905.

University of Leeds.—Report on a Test of Varieties of Wheat at Garforth. 1905. (12 pp.)

Unwin, A. H.—Future Forest Trees. (108 pp.) 1905.

Wood, L. S.—Principles and Practice of Farm Valuation. Second Edition. (260 pp.) 1905.

Hunting, W.—Art of Horse-Shoeing. Third Edition. (167 pp.) 1905.

India—

Buckley, R. B.—Irrigation Works of India. (336 pp.) 1905.

Straits Settlements.—Report on the Botanic Gardens, Singapore and Penang, 1904. (15 pp.)

Spain—

Baselga, P. M.—Enfermedades Infecto-Contagiosas de los Animales Domésticos. (287 pp.) 1905.

United States—

Bureau of Animal Industry.—Bull. 76. Score Card in Stock Breeding. (54 pp.) 1905.

Bureau of Chemistry.—Bull. 94. Studies on Apples. (99 pp. + v. plates). 1905.

Bureau of Entomology.—Bull. 54. Some miscellaneous results of the work of the Bureau of Entomology. VIII. (99 pp.) 1905.

Bureau of Soils.—Bull. 28. Studies on the Properties of an Unproductive Soil. (59 pp.) 1905.

West Indies—

Trinidad.—Government Stock Farms. Report, 1904-5. (12 pp.)

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of September, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 9	7 4	37 2	33 8
Herefords	7 9	7 2	—	—
Shorthorns	7 7	7 0	36 1	33 1
Devons	7 10	7 1	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7½	6¾	8¼	6¾
Sheep :—				
Downs	8½	7¾	—	—
Longwools	8	7¼	—	—
Cheviots	8¾	8	8¾	7¾
Blackfaced	8	7¼	8¼	7¼
Cross-breds	8¼	7¾	8¾	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 8	6 4	6 6	5 9
Porkers	7 2	6 9	7 0	6 4
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 17	17 15	20 8	15 14
,, —Calvers ...	19 14	17 4	18 5	15 1
Other breeds—In Milk ...	19 10	16 7	19 8	16 9
,, —Calvers ...	15 0	13 14	19 3	15 19
Calves for Rearing	2 11	1 12	2 3	1 8
Store Cattle :—				
Shorthorns—Yearlings ...	9 3	7 15	9 8	7 17
,, Two-year-olds	12 19	11 3	13 13	11 3
,, Three-year-olds	15 9	13 15	15 4	13 10
Polled Scots—Two-year-olds	—	—	15 1	12 14
Herefords— ,,	15 5	12 14	—	—
Devons— ,,	14 0	12 0	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	35 5	31 2	—	—
Scotch Cross-breds ...	—	—	27 2	23 5
Store Pigs :—				
Under 4 months	27 3	20 4	22 9	18 2

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	51 6	50 0	48 6	—	56 0*	55 0*
	2nd	49 0	45 0	43 6	—	53 6*	46 6*
Cow and Bull ...	1st	—	43 0	42 6	41 6	44 6	39 6
	2nd	—	36 6	35 6	36 6	37 6	32 6
U.S.A. and Canadian :—							
Birkenhead killed	1st	47 0	47 0	46 0	48 0	46 6	49 0
	2nd	44 0	40 6	39 6	42 6	42 6	43 0
Argentine Frozen—							
Hind Quarters ...	1st	30 6	31 0	30 6	30 6	30 6	31 6
Fore ,, ...	1st	23 0	24 0	21 6	21 6	24 0	24 6
Argentine Chilled—							
Hind Quarters ..	1st	35 6	38 0	39 0	38 6	—	42 0
Fore ,, ...	1st	23 6	26 0	24 6	24 6	—	29 6
American Chilled—							
Hind Quarters ...	1st	54 0	53 0	52 6	52 0	54 0	54 0
Fore ,, ...	1st	33 0	34 0	32 6	32 6	35 0	35 0
VEAL :—							
British	1st	67 6	58 6	62 6	70 0	—	—
	2nd	58 6	48 6	53 6	63 0	—	—
Foreign	1st	67 6	—	—	—	—	59 6
MUTTON :—							
Scotch	1st	71 6	67 6	69 6	70 0	73 0	69 6
	2nd	67 0	54 6	65 6	64 0	58 6	56 6
English	1st	—	67 6	66 6	62 6	—	—
	2nd	66 6	54 0	62 0	56 0	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	55 6	—	55 6	—	—
Argentine Frozen ...	1st	34 0	35 6	35 0	35 0	34 6	36 6
Australian ,, ...	1st	32 0	32 6	30 6	—	35 0	—
New Zealand ,, ...	1st	41 6	37 0	45 6	43 6	35 0	—
LAMB :—							
British	1st	71 6	67 0	66 0	67 6	73 6	70 0
	2nd	67 0	60 6	60 6	63 0	62 0	59 6
New Zealand ...	1st	50 0	51 6	48 6	49 0	48 6	53 6
Australian	1st	—	45 6	—	—	—	—
Argentine	1st	—	46 0	—	—	44 6	49 0
PORK :—							
British	1st	64 0	66 0	62 6	60 6	56 0	57 0
	2nd	55 0	56 0	57 6	55 0	53 6	49 6
Foreign	1st	62 6	65 6	66 0	66 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ...	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1	30 8	22 5	19 10	24 10	18 4	16 6	18 3
,, 20 ...	27 10	26 9	30 10	23 7	20 4	24 8	18 5	16 7	18 5
,, 27 ...	27 8	26 9	30 11	23 7	19 8	24 4	18 5	16 7	18 8
June 3 ...	27 6	26 10	31 3	23 10	18 8	23 6	18 4	16 8	19 1
,, 10 ...	27 8	26 6	31 4	21 5	18 5	24 0	18 7	16 10	18 11
,, 17 ...	27 6	26 5	31 7	20 7	18 2	26 0	18 3	16 8	19 1
,, 24 ...	27 6	26 5	31 7	22 0	19 2	23 9	18 6	16 10	18 10
July 1 ...	27 9	26 4	31 8	20 7	18 8	23 2	18 6	17 1	19 7
,, 8 ...	28 1	26 6	32 1	19 11	19 8	22 11	18 3	17 1	19 6
,, 15 ...	28 3	26 10	32 3	20 5	18 9	23 10	18 7	17 6	19 7
,, 22 ...	28 7	27 7	32 2	20 10	18 10	23 7	18 5	17 6	18 11
,, 29 ...	28 11	28 0	32 3	21 0	19 9	23 11	18 6	17 10	19 3
Aug. 5 ...	29 3	28 3	31 11	20 1	19 9	22 0	18 8	17 10	18 4
,, 12 ...	29 11	28 4	30 5	21 3	19 9	22 5	18 10	17 7	16 11
,, 19 ...	29 9	28 8	28 5	20 4	22 5	23 4	18 6	16 7	16 4
,, 26 ...	30 0	29 5	27 1	22 3	23 2	23 6	18 7	16 5	15 9
Sept. 2 ...	30 3	30 2	26 11	22 5	25 3	23 5	18 5	16 3	15 9
,, 9 ...	28 6	30 0	27 1	22 4	24 10	23 4	17 0	16 1	15 11
,, 16 ...	27 5	29 7	26 11	24 2	24 9	23 7	16 4	15 11	16 0
,, 23 ...	27 0	29 10	26 8	24 0	25 10	23 10	16 2	15 9	15 11
,, 30 ...	26 3	29 10	26 9	23 9	25 5	24 3	15 9	15 8	16 1
Oct. 7 ...	25 10	30 2	26 9	23 8	25 6	24 9	15 6	15 9	16 3
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ...	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	August ...	36 2	39 5	21 11	24 11	16 10	21 0
	September...	37 5	38 0	22 7	24 0	17 4	20 0
Paris:	August ...	37 9	41 0	22 2	25 7	18 8	22 1
	September...	38 7	39 5	23 7	24 2	19 0	20 2
Belgium:	July ...	29 10	32 1	20 8	23 4	19 2	22 0
	August ...	30 0	30 10	21 6	22 4	19 4	20 4
Berlin:	June ...	38 4	38 2	—	—	17 4	19 9
	July ...	37 10	37 9	—	—	20 0	19 7
Breslau:	June ...	37 3	35 3	22 3	25 7	16 2	19 4
	July ...	38 3	35 6	23 2	23 9	18 8	18 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of September, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	30 8	27 11	25 8	24 9	16 8	16 9
Norwich	29 11	26 10	25 11	22 9	15 4	15 1
Peterborough ...	29 5	26 0	23 7	23 0	15 3	15 2
Lincoln	29 5	26 3	23 4	23 8	15 6	15 7
Doncaster	29 0	26 6	23 6	21 3	16 8	15 5
Salisbury	29 6	26 10	24 0	24 3	16 9	16 8

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	14 3	13 6	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	114 6	112 6	114 0	109 6	111 6	109 0	112 0	—
Danish ...	122 0	120 0	124 6	121 0	123 6	120 0	122 6	—
Russian ...	105 6	102 0	116 6	112 0	102 0	100 0	105 0	—
Australian ...	111 6	107 6	—	—	—	—	—	—
Argentine ...	110 6	108 6	—	—	—	—	—	—
CHEESE :—								
British, Cheddar	74 0	72 0	—	—	70 0	65 0	61 6	56 6
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	60 0	52 6	63 0	56 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	56 0	55 0	57 0	55 0	55 0	53 6	56 0	54 0
BACON :—								
Irish	65 6	64 6	69 6	66 6	65 6	62 6	66 6	63 6
Canadian ...	59 0	58 6	56 6	53 0	59 6	56 6	60 6	56 6
HAMS :—								
Cumberland ...	100 0	98 0	—	—	—	—	—	—
Irish	101 0	97 0	—	—	—	—	102 0	92 0
American (long cut) ...	54 0	52 0	53 0	46 6	50 6	46 0	53 0	50 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	12 8	10 5	—	—	—	—	—	—
Irish	11 9	10 0	10 2	9 1	9 5	8 7	10 5	9 2
Danish ...	10 3	8 6	10 7	8 6	9 11	9 5	9 11	9 4
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	52 6	47 6	31 6	—	—	—	—	—
Main Crop ...	—	—	—	—	66 6	56 6	—	—
Up-to-Date ...	62 6	55 0	40 6	36 0	36 6	30 0	60 0	53 6
HAY :—								
Clover... ...	87 6	78 0	82 0	74 0	82 6	65 0	67 0	61 0
Meadow ...	78 6	59 0	71 6	61 6	—	—	64 6	60 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	September.		9 Months Ended September.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	51	68	643	1,038
Swine Slaughtered as diseased or exposed to infection ...	236	332	2,908	4,853
Anthrax :—				
Outbreaks	96	83	743	742
Animals attacked	140	119	1,054	1,166
Glanders (including Farcy) :—				
Outbreaks	114	166	941	1,196
Animals attacked	197	293	1,626	2,120
Sheep-Scab :—				
Outbreaks	22	24	676	1,089

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	September.		9 Months Ended September.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	6	36	45	175
Swine Slaughtered as diseased or exposed to infection ...	163	818	1,363	3,707
Anthrax :—				
Outbreaks	—	1	3	3
Animals attacked	—	1	3	3
Glanders (including Farcy) :—				
Outbreaks	4	1	17	9
Animals attacked	20	1	55	30
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	10	7	238	378

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XII. No. 8.

NOVEMBER, 1905. [NEW SERIES.]

FORMATION OF PERMANENT PASTURES.

THE SELECTION OF SEEDS FOR LAYING DOWN LAND TO GRASS—*continued.*

Since cheapness must be a chief qualification for a seeds-mixture intended for land that no longer pays for ploughing, and since no kind of inferior seed is so bad as inferior grass seed, it is clear that the problem of the mixture resolves itself largely into reducing to the lowest safe limit the number of seeds which we sow. I am not an advocate of what farmers call "thin sowing." I am quite aware of the sorry results that in practice have followed attempts to calculate the number of seeds required in the case of such crops as wheat, and I know that nothing short of experience can settle the actual numbers of grass and clover seeds that will give the best result, but I believe that we are at present without this experience. I, at least, cannot find any evidence of it that satisfies me, and I suspect that our present practice of sowing "plenty good seed," while it may produce a good pasture, does so at unnecessary cost, and at the expense of a heavy "infant mortality" in the plants we sow.

The number of seeds required must depend above everything else upon two factors: (1) on the plants composing the mixture, some of which, like rye-grass, white clover, and rough-stalked meadow grass, may occupy a great deal of space, and others, like crested dog's-tail and golden oat-grass, very little; (2) upon the tilth and condition of the soil. In the case of such small and delicate seeds, and with plants of such indefinite growth, it will readily be granted that ten million seeds in one case may produce a better surface covering than twenty million seeds in another.

Bearing these two points in mind, it may be worth while, in view of the further experimental study necessary, to discuss this question of the number of seeds.

The mixtures most recommended for laying down land to permanent grass will be found to contain about twenty million growing seeds. I have tried to ascertain the grounds on which this number has been arrived at. It is possible that it may depend upon figures published by Stebler, or that it represents the number found in the mixtures which general experience has led seedsmen to recommend, but it seems more probable that we owe them to Sinclair. He at least discussed this question of number carefully, and his method was followed by both Lawson and De Laune. By counting the number of plants growing on a square foot, Sinclair estimated that the richest pastures contained about forty-five million plants per acre, and in a well-managed water meadow he estimated the extraordinary total of seventy-nine million rooted plants, or about twelve to the square inch. To supply so many plants, Sinclair remarked that $4\frac{1}{2}$ bushels of a mixture which he recommends would be necessary, and he further says that after making allowance for barren seeds, this quantity "will be found for general practice not too much." He adds, "The practical trial mentioned at page 130 proved precisely the truths of the above calculations." (This experiment was made on two square yards of rich soil, and seed was sown at the rate of 5 bushels per acre.)

Making allowances for the differences in quality between the grass seeds of 100 years ago and of to-day, Sinclair's recommendations might now be translated to mean that from forty to fifty millions of seeds should be sown in order to reproduce the water meadow, and from twenty to thirty millions for old pastures of the best quality. De Laune recognises the impossibility of sowing so many seeds as are indicated by Sinclair owing to the cost, and he himself recommends a moderate number—about fifteen millions —but Sinclair's opinions are still held by a majority of those who recommend or prepare seeds-mixtures. Sinclair's estimate of the numbers of plants in old pastures appears to me to be extraordinarily high, and they can only be accounted for, I think, by assuming that he counted his plants when large numbers of

seedlings were coming up. Apart from seedlings and runners, an ordinary good pasture may contain from eight to ten million rooted plants. But admitting that Sinclair's figures do represent the highest class of pasture, let us ask if the conclusions he draws are correct. Can we deduce from the number of plants in an old pasture the number which ought to be sown? I do not think we can. The old pasture may be our goal, but it cannot, except in a very limited way, be our guide. We should remember that an old pasture must *grow* old, that the number of plants appropriate at 50 years is not appropriate at 5, and that the species present not only are, but must be, different in pastures of different ages.

No one appears to have studied the development of pastures, and to have put on record the changes which take place. We are therefore unable to say what is normal progress on well-managed land, but we can indicate three more or less well-marked periods in the life of the pasture. The first stage lasts for a year or two only. Rye-grass is vigorous; red clover grows well; cock's-foot and timothy, too, may make a fair show. The second stage begins about the third year. Red clover gradually disappears, rye-grass becomes thin and looks starved, cock's-foot and other grasses show signs of spreading, and, in damp seasons, alsyke and white clover cover up the land fairly well. But except in summer a considerable part of the surface of a pasture in the second stage is bare. This stage of the pasture is of very variable duration, but sooner or later a third stage is met with. If the land is poor and neglected, bent and Yorkshire fog appear; the land may then become "hide-bound," and remain indefinitely in a poor and profitless state. On the other hand, with good management or on naturally good soil, the better grasses are kept alive throughout the critical second stage, and gradually as vegetation spreads the bare soil becomes covered up, drought ceases to play havoc with the smaller grasses and white clover, nitrogen is fixed in the soil, and for a time fertility accumulates at a compound rate.* Perennial rye-grass, finding

* The high fertility of old pastures is well known, and Mr. A. D. Hall has lately pointed out that the accumulation may sometimes be much more rapid than until recently was thought to be possible.

once more abundant supplies of food, spreads over the surface, carpeting the ground with its dark green foliage; round the tufts of rye-grass the thirsty runners of white clover shade themselves from the June sun, and, winding in and out among their less adventurous rivals, seek for and send their roots into every bare spot of soil; while from under the leaves of rye-grass and foxtail appear fescues, dog's-tail, and other now flourishing survivors of a struggle in which many of their comrades have perished. In this way the pasture grows.

Though much may be done by manuring and by a wise choice of plants to hasten the coming of the third stage, it is not practicable to avoid the second stage altogether. In sowing down pastures, therefore, we must remember that the lean years will come, and that there is no use supplying in the mixture a greater number of plants than can be carried through them. It is not the forty million plants of the years of plenty, but the three or four million plants which the soil can safely carry through the years of famine that should indicate the seed-rate to us. In the same way, in selecting species for sowing, we must remember that we require plants for *three* stages, and that it is not the old pasture only which must be considered. It seems to me that a good deal of the controversy which has arisen around pasture plants has been due to forgetfulness of the fact that a pasture must be young before it is old.

It has been argued by De Laune and others that there should be no second stage, and that the falling off during the second period is entirely due to the use of rye-grass. I agree with De Laune to some extent; a heavy seeding of rye-grass is not only unnecessary, but is likely to cause undue depression in the second stage of the pasture's existence, but the omission of rye-grass will not prevent the falling off that will follow the disappearance of red clover and the loss by the surface soil of the tilth imparted to it before it was sown down. The second stage cannot be done away with, but, as I have already said, much may be done to shorten it by sowing the right species, by manuring, and by careful grazing.

In the Abbotsley experiment already referred to we have had illustrations of both successful and unsuccessful seeds-

mixtures, and I propose referring to both, for the purpose of indicating the direction in which we must work if we are to be successful in laying down clay land to grass. The figures in Table III. give the results produced by the successful mixture, No. VIII., and by two unsuccessful mixtures, Nos. I. and V. The latter have been failures for different reasons, and, together, they serve to illustrate the points I have discussed above. The figures, except those giving the composition of the hay in 1901, refer to the "B" sub-plots, which were manured with 10 cwt. basic slag per acre in the autumn of 1900. The 1901 figures are the averages for the four sub-plots, into which each acre sown with different seeds-mixtures was divided, but as the manures had scarcely begun to affect the herbage in 1901, these figures may also be taken as representing the "B" sub-plots.

The columns in the table show (1) the weight of seed sown; (2 and 3) the composition of the hay crops; (4) the proportion of the surface occupied by the different pasture plants; and (5) the approximate number of pasture plants in thousands.

The character of the plots in 1901, and the change which has taken place in their appearance and quality, are pretty fairly indicated by a comparison of the hay crops cut in 1901 and 1905. These crops weighed per acre:—

Mixture.	VIII.	I.	V.
	Cwt.	Cwt.	Cwt.
Abbotsley hay crop of ... 1901	27	$24\frac{1}{2}$	$21\frac{3}{4}$
Do. 1905	$36\frac{1}{4}$	$21\frac{1}{2}$	$14\frac{1}{2}$

If there was any plot for which success might have been predicted in 1900 it was No. V. It was sown down with an ample number of seeds; there was an abundance of red clover, cock's-foot, timothy, and meadow fescue to make a hay crop; the bottom grasses were represented by hard fescue, crested dog's-tail, and rough-stalked meadow grass; rye-grass was absent; the manuring was liberal and suited to the soil; but in spite of all this the pasture is now a complete failure. Nearly 15 per cent. of the surface is bare or weed-covered; cock's-foot forms coarse, ungainly tufts; timothy, though growing on a clay soil, is thin and weak; red clover has disappeared; alsyke has almost gone; and for every 100 seeds of white

clover sown in 1900 there is but one plant to-day. Why is this? The cause of the failure appears to be due to the omission of rye-grass. In the absence of this strong-growing grass the surface was not properly covered during the first season, the soil cracked in the sun, and many of the young plants were killed. Ever since 1902 I have watched this plot, and that this is the explanation of the failure I have no doubt. Once cracks establish themselves in new pastures the plants along the margins die off, the cracks re-appear and tend to grow worse in each succeeding period of dry weather. I have come to the conclusion that on strong bare soil, in a hot dry climate, the protection afforded by rye-grass far outweighs its disadvantages, and for this reason it should not be omitted from the seeds-mixture.

Mixture V. illustrates the kind of failure that must be expected when the farmer forgets that a pasture must be young before it becomes old. Mixture I., on the other hand, appears to me to illustrate a failure due to just the opposite reason; this is the sort of mixture that would give first-rate results if a pasture always remained young, but though very often employed for the purpose, it is most unsuitable for any pasture which is intended to grow old. Up to the present time, indeed, there is not much cause for complaint with Mixture I. at Abbotsley. In spite of its cheapness, it has produced the second best pasture in the field; stock like it, (they invariably graze the rye-grass before the plots chiefly composed of cock's-foot and meadow fescue); and the area of bare soil is small as compared, for example, with No. V. In 1902 and 1903 the surface was well covered by white clover, but this plant has now become thin and weak, and it is clear that, in the present compact and somewhat poor condition of the surface soil, white clover finds rye-grass a grasping and undesirable companion. If rye-grass had permitted the clover to live on, there would have been little reason to quarrel with Mixture I. to-day, but it has not done so. In this second stage of the pasture's history rye-grass assumes its least attractive form, and I will so far side with the opponents of rye-grass as to admit that, during this period, I would rather have 10 or 20 per cent. than 60 to 80 per cent. in a pasture.

TABLE III.—SUCCESSFUL AND UNSUCCESSFUL SEEDS-MIXTURES ON AN OXFORD CLAY SOIL AT ABBOTSLEY.

Plants sown.	Mixture VIII.—(Cost 39s. 6d.)					Mixture I.—(Cost 14s. 6d.)					Mixture V.—(Cost 45s. 9d.)				
	Weight of Seed.	Composition of Hay, 1901.	Composition of Hay, 1905.	Composition of Pasture, 1905.	No. of Plants per acre, 1905, in thousands.	Weight of Seed.	Composition of Hay, 1901.	Composition of Hay, 1905.	Composition of Pasture, 1905.	No. of Plants per acre, 1905, in thousands.	Weight of Seed.	Composition of Hay, 1901.	Composition of Hay, 1905.	Composition of Pasture, 1905.	No. of Plants per acre, 1905, in thousands.
	lb.	%	%	%		lb.	%	%	%		lb.	%	%	%	
Perennial red clover ...	2·0	3·8	2·9	1·7	43	2·5	4·9	Trace	—	—	3·75	43·8	Trace	—	—
Alsyke clover	2·0		1·7	—	—	1·5		5·5	2·1	65	2·25		2·1	0·3	11
White clover	2·0	4·9	19·5	43·4	217	1·25	0·5	2·75	7·0	87	1·75	3·8	Trace	7·0	98
Kidney vetch	2·5	0	0	—	—	—	—	—	—	—	—	—	—	—	—
Italian rye-grass	4·0	74·0	31·0	9·9	522	—	—	—	—	—	—	—	—	—	—
Perennial rye-grass ...	—	—	Trace	—	—	42·0	93·7	81·75	81·8	2,178	—	Trace	2·2	6·9	283
Cock's-foot	6·0	1·6	14·4	11·6	216	—	—	1·3	—	—	5·5	19·8	22·2	25·6	228
Timothy	—	—	—	—	—	—	—	2·2	—	—	3·5	7·7	8·6	3·5	185
Meadow fescue	5·0					—	—	—	—	—	9·0	19·4	37·4	18·1	522
Tall fescue	2·0	3·2	23·0	10·6	370	—	—	—	—	—	—	—	—	—	—
Hard fescue	2·0	—	—	1·2	98	—	—	—	—	—	4·5	0	4·5	9·5	326
Tall oat-grass	3·0	1·7	—	—	—	—	—	—	—	—	—	—	—	—	—
Golden oat-grass	0·5	0	0·5	0·2	11	—	—	—	—	—	—	—	—	—	—
Meadow foxtail	—	—	—	—	—	—	—	—	—	—	1·75	Trace	2·2	2·8	119
Crested dog's-tail... ...	—	—	Trace	—	—	—	—	1·5	0·5	21	3·75	Trace	11·9	8·3	326
Rough-stalked poa ...	0·5	0		2·6	185	—	—	0·75	—	—	2·5	1·5	1·4	3·3	196
Smooth-stalked poa ...	2·0	Trace	1·8	5·0	294	—	—	—	—	—	—	—	—	—	—
Burnet	8·0	10·8	Trace	0·3	11	—	—	—	—	—	—	—	—	—	—
Chicory	2·0	Trace	0·5	1·0	43	—	—	—	—	—	—	—	—	—	—
Sheep's parsley	1·0	0	0	0	0	—	—	—	—	—	—	—	—	—	—
Yarrow	1·0	Trace	0·9	9·9	185	—	—	—	—	—	—	—	—	—	—
Weeds and moss	—	—	3·4	0·7	43	—	0·9	3·5	4·8	86	—	4·0	6·4	3·2	131
Bare soil	—	—	—	1·7	—	—	—	—	3·5	—	—	—	—	11·4	—
Total	45·5	100·0	101·8	99·8	2,283	47·5	100·0	98·45	99·7	2,437	38·00	100·0	98·9	99·9	2,424

And now we come to a successful mixture, so successful that in placing the Abbotsley plots in order of merit, we may say "No. VIII. first, the others nowhere." The mixture is one of those containing deep-rooted plants, which was mentioned by Mr. R. H. Elliot, of Clifton Park, in a paper written for the *Journal of the Royal Agricultural Society of England* in 1897. It was successfully employed by him in sowing down 25 acres of poor land 600 feet above sea level, land of very different quality from the strong low-lying soil at Abbotsley. The chief peculiarity of the mixture is that it contains chicory, burnet kidney vetch, and yarrow, but though some of these have been of value and have contributed to the success of the mixture, it is not the deep-rooted plants that now give the pasture its character. From the analysis of the herbage it will be seen that 45 per cent. of the surface is covered with clover, so that there is four or five times as much clover on Plot VIII. as on any of the other plots. While it is the fine close covering of white clover that gives Plot VIII. its special value, it should be noticed that other species are well represented. Cock's-foot, meadow fescue, Italian rye-grass, and yarrow, each contributes about 10 per cent. to the herbage ; the meadow grasses form $7\frac{1}{2}$ per cent. ; and there is a fair sprinkling of chicory. Weeds and bare soil occupy but 2·4 per cent. of the surface, as against 14·6 in the case of No. V. Another good point to be noticed in the growth of Elliot's mixture is that the cock's-foot plants are of moderate size. The tufts are only half as large as on several of the other plots. The general resemblance of the herbage to that of an old pasture has been commented on by visitors ; and live stock, both sheep and cattle, have decided that of the 32 plots contained in the experimental field, this one is most to their liking.

While it is doubtless the character of the mixture that has made the luxuriant growth of white clover possible, it is equally clear that the healthy colour of the grasses and the thick even sward are in turn the result of the improvement of the soil effected by the clover. Without this strong development of white clover, the deep-rooting plants and the grasses would not have produced a pasture of any great value. This is shown by the figures in Table IV., which give the composition of the

hay crops and pastures produced on the unmanured land (Plot VIIIA.) and on the manured land (Plot VIIIB.), also the seed-rate, the number of seeds, and the cost of the seeds sown.

TABLE IV.—EFFECTS OF MANURE ON ELLIOT'S MIXTURE.

Plants sown.	Elliot's Seeds-Mixture.			Character of Pastures. VIIIA.—No Manure.			VIIIB.—10 cwt. Basic Slag.		
	Weight.	No. in thousands.	Cost in 1905.	No. of Plants in thousands.	Area occupied.	Weight in Hay.	No. of Plants in thousands.	Area occupied.	Weight in Hay.
			s. d.		%	%		%	%
Perennial red clover ...	2·0	427	2 4	54	1·2	2·6	43	1·7	2·9
Alsyke clover	2·0	1,407	2 2	—	—	0·6	—	—	1·7
White clover	2·0	1,434	2 0	163	8·7	6·4	217	43·4	19·5
Kidney vetch	2·5	472	2 1	0	0	0	0	0	0
Italian rye-grass ...	4·0	1,069	1 2	490	10·4	37·7	522	9·	31·0
Cock's-foot...	6·0	2,428	6 0	185	25·7	8·9	216	11·6	14·4
Meadow fescue	5·0	1,168	3 1	370	25·9	34·1	370	10·6	23·0
Tall fescue...	2·0	964	4 0						
Hard fescue..	2·0	1,110	1 2	141	3·6	1·0	98	1·2	1·0
Tall oat-grass	3·0	373	3 3	—	—	—	—	—	—
Golden oat-grass... ...	0·5	560	1 6	21	0·3	0·8	11	0·2	0·5
Rough-stalked poa	0·5	1,084	0 10	163	3·0	2·2	185	2·6	1·8
Smooth-stalked poa	2·0	3,162	1 6	152	2·3		294	5·0	
Burnet ...	8·0	518	3 4	54	0·7	0·4	11	0·3	Trace
Chicory ...	2·0	569	2 4	32	0·7	Trace	43	1·0	0·5
Sheep's parsley	1·0	195	0 7	0	0	0	—	0	—
Yarrow ...	1·0	3,334	5 6	119	8·5	1·5	185	9·9	0·9
Weeds ...	—	—	—	54	3·1	*7·5	43	0·7	3·4
Bare space...	—	—	—	—	5·9	—	—	1·7	—
Total ...	45·5	20,254	42 10	1,998	100·0	99·3	2,238	99·8	100·6

* Includes 3·7 per cent. of timothy not sown.

A point upon which Mr. Elliot insists strongly is that the presence of deep-rooting plants in a seeds-mixture renders the pasture independent of manure.† His experience may justify this conclusion for his own farm. If so, it merely proves that his land is fairly well supplied with phosphates, potash, and the

† "Agricultural Changes and Laying Down Land to Grass," 3rd Edition, Chap. vii.

other food-materials of which the soil is the ultimate source, but that humus and nitrogen have been lacking. On soils deficient in phosphates or potash, it would be most unwise to attempt to form pastures without manuring. The Abbotsley soil, which happens to be deficient in phosphates, clearly shows what happens when manuring is neglected.* In 1901 the hay crop produced by Elliot's mixture was 27 cwt. on the manured plot, and 26½ cwt. on the unmanured land. The manure applied in the previous autumn had scarcely begun to work, and the sub-plots were of equal merit. In 1902, however, the manures began to tell, and so marked was the influence of basic slag that in 1905 (no further application of manure having been made in the meantime) Plot VIIIB. yielded 36½ cwt. of hay, while Plot VIIIA. produced but 17¼ cwt. The contrast in the pastures was as marked as in the hay crops. Instead of 43 per cent. of white clover which was present where basic slag had been used, the unmanured land contained but 9 per cent. In place of 2·4 per cent. of bare and weed-covered surface, there was 9 per cent., and in place of a fine even turf, there was a coarse and irregular pasture, disfigured by large tufts of cock's-foot.

Elsewhere,† I have shown that the great improvement which basic slag effects on the herbage of poor clay soils is due to its influence on the development of the *Leguminosæ*. Gramineous and miscellaneous pasture plants do not respond in any marked degree to phosphatic manures. At Abbotsley, the successful result obtained on Plot VIIIB. as compared with Plot VIIIA. in the years 1902-1905 is obviously due to the influence of basic slag upon white clover, but this explanation does not altogether account for the success attained on Plot VIIIB. All the "B" plots received basic slag, all of them contained white clover in 1901, and on some white clover was abundant up till 1903, but now there is more white clover on the eighth plot than on the other seven put together.

The marked effect of basic slag on Plot VIII. and its failure on the other plots has been due to several causes. I will refer to one only, which seems to me to be the most impor-

* On p. 119 of his book Mr. Elliot erroneously cites Abbotsley as supporting his opinions on the subject of manuring.

† *Journal of Agricultural Science*, Vol. I., p. 136.

tant. This is the effect produced on the stubborn clay soil by chicory, burnet, and yarrow. These deep-rooting plants, as has been pointed out by Mr. Elliot, open up and aërate the soil, they assist drainage, make the surface more friable, and prevent cracking, and in this way they have doubtless enabled white clover to cover the surface. Once the covering of vegetation is complete, the pasture is safe.*

The influences at work on the mixed herbage of the pasture are varied, and the man who expects first-rate results must be prepared to adapt his management to varying circumstances, so that rules cannot be given for the formation of first-rate grass land. The experiments referred to in the foregoing pages, however, suggest some principles that may assist the farmer in his task.

The main point, and one on which I have already insisted, is that pastures must *grow* old by degrees, that the herbage passes through stages, and that no management will be satisfactory which neglects to take account of the needs of the pasture in any one stage. The young pasture must be furnished with quick-growing vigorous plants, which will ensure an even covering for the first few years. As the tilth imparted by the plough disappears, the second stage begins, and the aim of the farmer must be to shorten this trying period by liberal manurial treatment. With the onset of the third stage, and as the grasses begin to develop, careful grazing will be required to ensure a regular growth of the mixed herbage.

But our immediate concern is with the seeds-mixture. How is it to be compounded? We aim at producing a permanent pasture with a mixed herbage, but the beginning of the "permanent" stage of the pasture is five or six years off, and it is needless to sow down a full stock of all the plants we hope the field may contain fifty or even twenty years later, for the soil has not yet acquired the condition that will enable it to support these plants. We must therefore content ourselves with sowing as much seed as will produce the number of permanent plants

*This year I had occasion to cut some turfs from the Plots I., IV., VII. and VIII., and it was quite remarkable to find how much moister the soil of the last was than that of the others. In lifting the other turfs, particularly those of IV. and VII., great care had to be taken to select turfs free from cracks, and the turfs cut were dry and crumbly, but on VIII. the turf came up smooth and moist, and showed no signs of cracking. Originally, of course, the soils were identical in character.

that the land can carry through the first half-dozen years. The probable number of plants which poor clay land will carry is indicated by the figures given in the foregoing tables, but more experimental evidence is required before we can say how many seeds are likely to be necessary under the various conditions that occur in practice. It is certain, however, that the ultimate number of plants will depend quite as much upon the management as upon the numbers sown down.

The herbage of the pasture during its second stage ought chiefly to consist of white clover, and if we succeed in getting from 30 to 40 per cent. of the surface covered by this plant during the late summer months of the third, fourth, and fifth seasons, we are likely to achieve success.

It is the herbage of the first year or two that presents most difficulty. We must on the one hand have a perfectly covered surface, while on the other we must avoid killing off the greater number of the seeds sown by overcrowding them before they are well established. It is because Elliot's mixture has proved a good "first stage" mixture that it now promises to form a good permanent pasture. The small quantity of rye-grass in this mixture is one of its features, yet the mixture produced as good a hay crop in 1901 as any other, and three-fourths of the hay crop was rye-grass. In Elliot's mixture, Italian rye-grass was used. I would prefer, however, to use both rye-grasses. Italian rye-grass will disappear and leave room for the growth of white clover in the second stage, while we want perennial rye-grass as a permanent species, for no grass is likely to be more useful in the old pasture. In the first stage perennial rye-grass is also useful, but it is an "undesirable" in the second stage, and the quantity sown should be limited. It is likely that under ordinary circumstances from 3 to 7 lb. per acre would be enough.

The clovers should be sown in moderate quantities; nothing is gained by thick sowing. If the crop of the first year is cut for hay, as it usually is, red clover may form so thick a covering that the smaller plants are drawn and weak; further a thickly sown crop of red clover seems to die out more completely than a crop in which thin seeding permits a better development of the individual plants. Burnet and sainfoin, which may be purchased mixed, as also lucerne, chicory, and yarrow, should be

included in the mixture. These plants are either useful in themselves or are indirectly useful in opening up the soil by means of their strong roots, and further, in the case of burnet and chicory, by keeping the hay crop erect and open, thus allowing light to reach the white clover and young grasses.

Visitors to the Abbotsley plots have asked me to suggest a mixture based upon Elliot's mixture, which has been so successful there, but costing about £1 an acre. As the mixture prepared in response to this request will put the foregoing suggestions in a concrete form, I submit it to the readers of this paper. The prices and number of seeds, which are approximate, have been taken from the 1905 price-list of Mr. James Hunter, of Chester.

SEEDS-MIXTURE FOR LAYING DOWN POOR CLAY SOIL TO PERMANENT PASTURE PER ACRE.

Plant.	Weight.	Number of Seeds in Thousands.	Cost.	
	lb.		s.	d.
Italian rye-grass	4	1,069	1	1
Perennial rye-grass	3	635	0	7
Timothy	1	1,307	0	6
Cock's-foot	2	809	1	10
Meadow fescue	2	467	1	2
Tall fescue	$\frac{1}{2}$	120	0	5
Hard fescue	1	555	0	6
Meadow foxtail	1	441	1	2
Tall oat-grass	$\frac{1}{2}$	62	0	6
Golden oat-grass	$\frac{1}{4}$	280	0	8
Rough-stalked poa	$\frac{3}{4}$	1,626	1	2
Smooth-stalked poa	$\frac{3}{4}$	1,085	0	6
Crested dog's-tail...	$\frac{1}{4}$	210	0	9
Perennial red clover	$1\frac{1}{2}$	320	1	5
Alsyke clover	$1\frac{1}{2}$	1,055	1	6
White clover	2	1,434	1	10
Lucerne	1	219	0	10
Sainfoin	5	110	0	6
Burnet	4	259	1	7
Chicory	1	284	0	11
Yarrow	$\frac{1}{8}$	417	0	9
Total	$33\frac{1}{8}$	12,764	20	2

The mixture is intended for use on poor clay soils, and as such soils in the eastern and southern counties are often very deficient in phosphates, I would recommend the application of 3 to 4 cwt. of superphosphate before sowing the grass seeds,

and of 5 to 7 cwt. of basic slag in autumn, after the first hay crop has been cut. Basic slag will greatly encourage the growth of the clovers, and if subsequently the stock grazing the pastures receive oil-cakes, the permanent grasses will benefit.

The above quantity of seed should be enough for clean land in good tilth. On a rough surface increase the rye-grass and red clover to ensure a cover; and to counteract the effects of rye-grass on the other pasture plants, manure liberally about the third or fourth season. T. H. MIDDLETON.

DUCK RAISING.

Every species of live stock has its individual qualities, which require to be carefully studied if we are to attain the greatest amount of success. Conditions which are favourable to, and methods which meet the needs of animals of one kind, are totally inadequate for and unsuited to others. Soil, climatic influences, available space, have all to be considered, and no fact is more apparent in connection with stock raising than that the conditions must be in conformity with the nature of our domesticated animals. What can be accomplished with stock in one place may not be possible in another. The diversity of soil and climate, which is so marked a feature of Britain, explains why there is such a great variation in the stock of the country, and why our farmers have succeeded in placing themselves in the front rank as breeders of high-class animals of all kinds. What is true in respect to horses and cattle and pigs is equally so with the different species of poultry.

Districts suitable for duck raising. — Districts which are specially suited to the raising of chickens may not be equally favourable for ducks, while those where ducklings can be reared with advantage are generally undesirable for turkeys. Market requirements must, of course, be regarded, but it is useless to attempt to force production where natural influences are antagonistic. Where the object is the raising of ducklings there can be no question that valleys or well-watered plains are much better than the higher lands, and for the breeding stock the presence of sufficient water in which they can exercise themselves is important. What should be avoided is dry or harsh soil, for there satisfactory results can hardly be expected.

Space required.—A further question which presents itself for consideration is the amount of space available. Fowls, geese, and turkeys alike are active in habit, and thrive best when they have an abundance of range; fowls, when the adult stage has been reached, may be confined to a relatively small area, especially where egg production is the main object, but this is at best an expedient which has its limitations. During the growing period their activity makes them less amenable to restriction. As they grow their range increases, and greater success is obtained if they can be given full freedom. Geese and turkeys, both old and young, must have free range. Hence they are essentially farmers' fowls, only to be kept by those who are not limited to a small area of land. To attempt the rearing of these birds under conditions which are sufficient for chickens and ducks would be to court disaster. In fact, the number of geese or turkeys kept or bred should be about the same per acre as the number of sheep.

Ducks occupy a place by themselves. Whilst the older birds—the breeding stock—thrive all the better for plenty of space and for an abundance of water, the youngsters can be massed together to an extent which would be fatal to any other class of poultry. Why that should be so has not yet been explained, but it is none the less a fact. During the infantile stage, when they are fed for early development, they appear to be able to sustain forcing for a longer period than any other species of poultry, and the desire to wander about is apparently dormant. Further, they appear to be less influenced by the injurious effects of tainted ground than are chickens or young turkeys. The "duckers" of the Vale of Aylesbury and surrounding districts have for very many years been able to rear large quantities of ducklings upon small areas, where the birds are crowded together in great numbers with no ill results such as would be looked for if like methods were adopted with chickens. Duck farming, therefore, presents special advantages to the occupier of a small area of land, as he can raise a much larger number of birds per acre per annum than would be possible with any other class of poultry.

Value of duck manure.—The high value of duck manure is recognised by those who have kept these birds, but

as yet is not appreciated by farmers generally. Upon this question scientific observation is needed, but those who keep large numbers of ducks bear testimony to the remarkable improvement in the herbage of pastures upon which the ducks have been thickly kept for one season, and their practical experience leads to the conclusion that the manurial effect is felt for three or four years. In some instances the number of birds kept is so large that the grass appears to be entirely eaten off, and the earth is quite bare ; the grass, however, springs up luxuriantly the following year, the manure apparently favouring the finer grasses. Hence ducks may have an economic value in the improvement of pastures, apart from any profit which they may yield. Upon farms where fresh ground can be used for the ducks annually they may take the place of larger stock, and avoid the necessity of using artificial fertilisers.

Buying eggs for hatching.—Upon some of the establishments in America where duck raising on a large scale is followed it is customary to keep large flocks of adult birds for breeding, up to as many as 500. These are divided into flocks of about fifty, of which ten or fifteen are drakes. The drakes are by no means quarrelsome, but appear to live peaceably with each other. The capital expenditure for houses is therefore much less than with any other class of poultry. In the Oudenarde district of Belgium, where duck raising is a very important industry, the breeders are usually small farmers, who do not keep large flocks, but allow their birds to run together. In Britain a different system prevails from that met with in either of the countries named, in that, as a rule, the duck raisers do not keep the breeding stock, but purchase eggs for hatching from farmers and others. Such a division of labour has many advantages. In America land is cheaper and more plentiful, whilst in Belgium the open lands afford an opportunity for dispersion of the birds which would not be available with us. Probably, however, the chief reason why duck raisers buy their eggs is that originally they were mainly small occupiers who could not attempt to keep both breeding stock and youngsters, on account of the amount of space required for the former. It was, therefore, found more profitable to leave the work of breeding to others, to purchase the eggs, and to confine attention to the work from the time

hatching commenced. By so doing the ground could be left vacant for several months of the year, although many of the "duckers" do not trouble themselves in that direction, as the birds have no access to grass at any period of their existence. What is found to be almost a necessity with "duckers" has proved equally desirable where operations have been on a larger scale. The one point in favour of the American plan is that the race or quality of the stock can be controlled, but on all other grounds the plan adopted in this country is preferable, as the breeding stock is kept by ordinary farmers under more natural conditions, and the ducklings are hardier. The largest duck raiser in this country does not keep any breeding stock, relying entirely on purchased eggs to the number of about 50,000 per annum. Ducks are kept in the district around this farm to an extent never known before, although a sufficient supply is not yet obtainable locally—in fact, the difficulty in obtaining eggs has been considerable.

Breed.—The breed of ducks which is found to be the best adapted to the British market is the Aylesbury, formerly called the White English. This breed is the most rapid in growth and fattens well at an early age, thus meeting the duckling trade in the spring and early summer, when prices rule high for good specimens. Birds of this breed can be brought into killing condition at the age of seven to nine weeks, when they weigh 4 to $5\frac{1}{2}$ lb. No other breed will accomplish like results in the same time. For the autumn and winter trade the Rouen is preferred, as it attains a large size and has the finest flesh of all the duck family. But the demand is comparatively small at that season of the year. Ducks are heavy eaters, and to produce a bird six months old involves considerable expense in food and diminishes the profit.

Water not required for ducklings.—That adult stock of this species require water in which to swim is generally acknowledged. The absence of what is their natural element does not decrease the productiveness of ducks, but it is found that ducklings bred from birds kept entirely on the land are less vigorous, do not grow nearly so fast, and are more subject to disease. But so far as young birds are concerned whose life only lasts a few weeks, they grow more rapidly if they are

denied water except for drinking purposes. The greater majority of English ducklings marketed during the spring and early summer have never been in water, though sometimes "duckers" allow the young birds a bath a day or two before they are killed.

Stock birds should not be forced.—Where they are intended as stock birds, however, the better plan is to give them full liberty after the first fortnight of their existence and allow them access to water, though by so doing development is retarded and they grow slowly as compared with those which are subjected to the forcing treatment named above; they have a stronger frame and a reserve of strength which is essential to their future work as breeding stock. Size is attained ultimately, but not with the same speed, and they are not fit for slaughter as ducklings.

System of hatching.—In Britain the system of hatching has been until quite recently entirely by means of hens, artificial methods not being favourably regarded in the duck districts of Buckinghamshire and Bedfordshire. Though this feeling is not so pronounced as formerly, incubators having been used within the last few years by progressive duck breeders, the majority still regard the natural method of hatching as alone calculated to secure success. Where the ordinary system is retained, hens—not ducks—are used for hatching, as it is recognised that ducks are unreliable and late in becoming broody, and, therefore, of no use for producing early birds. Up to a few years ago it was considered doubtful whether artificial incubation would give as good results with ducklings as with chickens, but since then American and British breeders have proved that duck-hatching upon a large scale by means of incubators can be made successful, and that for bringing out these birds in a wholesale fashion it is the only method which can be depended upon. Artificial incubation has proved quite reliable if a plentiful supply of fresh air is ensured and the eggs are damped daily. Formerly the great difficulty was to rear the artificially-hatched ducklings, but the process is now better understood. Ducklings require heat for a much shorter period than do chickens; during ordinary weather a week to ten days is quite sufficient, but when the weather is severe they may be retained in heated brooders for a few days longer. Ducklings are frequently raised without

any heat at all in the mild season, being simply kept in small boxes, wherein their own body heat is sufficient, but it is wise to be on the safe side.

Feeding.—Ducklings should have an abundance of fresh air, and be fed at regular intervals upon a highly nitrogenous diet. Meat in one form or another appears to be essential, and experiments have shown that without meat growth is slow, the birds being easily affected by chills, which are fatal. A plentiful supply of worms will suffice, otherwise meat must be supplied. Tallow greaves are extensively used in the uck districts, but other forms are equally good. For the highest-priced ducklings cooked rice is largely employed, but when meat is used any of the ordinary meals may be used, except that maize should be mixed with thirds or toppings, as it is too fattening and stimulating if fed alone.

Housing.—Ducklings can bear a considerable amount of exposure after they are three weeks old. Many "duckers" keep them in houses built like pigsties, with an open yard in front. Another method is to enclose plots of ground, about eight to the acre, with wire-netting a foot in height. In each park or run is placed a small house, which may be of the simplest character. Packing cases answer excellently for the purpose with a little alteration, the lid forming the door, a few holes being made for ventilation, additional cases being provided as the inmates grow beyond the accommodation. But during the later part of the period of growth such protection can be dispensed with, and they may be allowed to remain in the open day and night. Under such conditions it is sometimes necessary during the prevalence of high winds or driving rain to hang sacking over the netting as a measure of shelter. In America more elaborate provision is made, in that long ranges of shedding are provided, divided inside into compartments by foot-high boards, and having small runs outside formed by wire-netting. Sheds of this description exist in this country. Under such a system there must be a considerable waste in the manure produced and an increased danger of the runs becoming tainted. As these large houses cannot be moved the plan of moveable pens is to be preferred, and the same ground should not be used for the ducks for more than four years. The cost of removal of runs is small, and more than compensated by the crops or feed secured.

Duck raising affords a profitable pursuit to small holders, and it is equally suited to farmers who are willing and able to give the necessary time and attention to the birds and who can obtain a supply of eggs at the right season. But it is an industry which entails hard work and skill in handling large quantities of birds for several months of the year.

EDWARD BROWN.

FEEDING FOWLS FOR EGGS IN WINTER.

Poultry-keepers cannot expect to make their fowls pay unless they first become possessed of the right stock, and experiments have proved the necessity of dispensing with old mongrel hens, and replacing them with strong healthy pullets, hatched after the first week in March and before the first week in April ; such birds, may as a rule, be relied upon to produce winter eggs. The laying qualities of all fowls are a matter of breeding as well as feeding and housing, but the secret of winter egg production, undoubtedly, lies in the feeding.

Where it is desired to keep up a regular supply of winter eggs half of the stock should consist of pullets, and these if carefully fed should give a fair quantity of eggs right through the winter. Second-season hens are also reliable and good for the purpose provided they are carefully fed previous to and during moulting, but if neglected at this, the most critical period of the year, they seldom produce many eggs before the spring.

In the month of July, when the young pullets are sufficiently developed, those that appear suitable for laying purposes should be retained, and all the others fattened and killed.

Feeding the pullets.—It is a poor policy to overfeed and to have a lot of food left standing about. No rules can be laid down as to the quantity of food birds will consume, the best guide being their appearance when approached ; if hungry they will appear anxious and eager to get their meal, otherwise less than the usual quantity of food should be given. In other words, always allow the birds to go away with an appetite for more.

For winter egg production it is best to commence feeding three times daily when the pullets are first selected.

For the morning feed use a mixture composed of two parts pollards, four parts barley meal, half part bean or pea

meal, two parts oatmeal, and quarter part prepared meat (scalded). The foregoing should be mixed together with warm water and given in a crumbling state, troughs being used for the purpose. If soft food is thrown about where there are dry leaves, grass, straw, or similar rubbish, evil results often follow through fowls being cropbound. Although there may be plenty of grass, there is nothing more helpful in winter than a midday feed of some kind of greenstuff. Thousand-headed kale is best, but failing this cabbage may be used.

For the evening meal use wheat, oats, and kibbled maize in rotation, changing the grain each week. This should be scattered wide, or in a way that it will give the fowls plenty of exercise to gather it.

If it can be managed it is advisable to keep the pullets in a field or on a grass-run and separate from the hens until the end of October, when they may be moved into their winter quarters, if there are any. Many of the early pullets should be laying by this time, and as it is certain to take them a week to get used to their new quarters the egg current is not so likely to be interfered with by the upset of moving as when the weather gets colder.

Feeding the hens.—Many hens are kept which fail to produce an egg for several months each winter. A large number of these hens are useless for the purpose for which they are kept, but the remainder, with care and proper feeding, would be egg producers. There are two months in the year when hens require special attention as to feeding—September and October—and many hens that would be egg producers fail through neglect at this period. The injury is caused through want of helpful food during moulting, so as to enable them to get their young feathers quickly without check to the system and before the cold weather comes.

Special feeding should start as soon as a sign of moulting appears. Experiments made on fifteen hens just beginning to moult, and selected from a yard of 180, gave the following results:—They were placed in three different pens of five birds each on September 9th, and kept there until the 9th February following.

No. 1 *pen* had nothing but hard grain, consisting of wheat and maize, with cold water to drink, and were kept without

grit, shell, or green stuff. The last hen finished moulting about the middle of November, one died on December 14th, and another laid six eggs in the month of January.

No. 2 pen were fed in the morning on four parts by bulk of barley meal, two parts ground oats, and two parts pollards, mixed with cold water; with wheat, barley, and maize alternately in the evening; grit and oyster shell occasionally; cold water to drink. The last hen completed her moult at the beginning of November, one started to lay on 4th November; two more in December, and another in January. Eighty-two eggs were obtained altogether.

No. 3 pen as a morning feed had two parts by bulk pollards, four parts barley meal, one part old bean meal, two parts oatmeal. This was mixed with hot water and soup, the soup being obtained by boiling in a copper large bones and a few pieces of fat obtained from butchers. Another addition, three days in the week, was boiled linseed. A pint of pure linseed was put in a saucepan and four pints of water added. This was then placed on the fire and allowed to boil slowly until it became of the consistency of gruel; after being allowed to cool, half a pint was used at a time, mixed with the other soft food. This constituted the morning feed, which was always placed in troughs. To drink they had warm water and milk. About mid-day some kale or cabbage, with a few heavy oats, was given. In the evening wheat or maize, and old peas once a week, with a plentiful supply of grit and shell. This pen of birds were all moulted by the second week in October, and kept in perfect health and plumage right through the winter. One bird started to lay on the 21st October, and another on the 23rd, and by the end of November four were laying regularly; the other laid a few eggs in December, but soon stopped and was useless except to kill. The other four birds laid 195 eggs. Similar results were obtained with pullets.

It will be noticed when visiting poultry shows held in the winter, that many of the hens or pullets exhibited are laying although the weather may be severe and eggs scarce. These birds are continually being sent about the country and subjected to rough handling and exposed positions, often in a draught. The reason why they lay when country birds do

not is that being show birds they are carefully fed on good substantial food, and given every attention when at home. Dairy farmers carefully study the feeding of their cows in order to keep up the supply of winter milk, and in the same way poultry-keepers must remember that winter eggs can only be produced by those who are careful in the feeding of their fowls.

W. F. SNELL.

Cross-fertilisation of Wheat.

Among the problems which have come before the Home Grown Wheat Committee of the National Association of British and Irish Millers in their investigations into the production of "strength" in wheat,* one of the most interesting is the question of obtaining by artificial cross-fertilisation a breed of wheat which, while maintaining the high yields of modern English wheat, shall also approach in "strength" the hard American varieties. An account of the principles of cross-fertilisation or hybridising is given by Mr. A. E. Humphries, the Chairman of the Committee, in a paper presented to the International Convention of Millers held at Paris in October last, which shows very clearly the means adopted to obtain results in this direction. It is only by hybridising or by selection that results in the improvement in the quality of English wheat are now anticipated, the experiments which have been carried out up to the present having clearly shown that such influences as spring or autumn sowing, manuring, early or late cutting, have no appreciable effect upon the strength of wheat, while even by means of selection alone no results worth the trouble taken have as yet been obtained.

In the last five years the value of hybridising to the wheat breeder has been increased very greatly. Every grain of wheat is produced by a form of sexual connection, and the idea of taking pollen from one sort and placing it in such positions that the ovaries of another sort receive the strange infusion to produce fresh sorts of wheat is not at all new. Nature herself does not indulge in such operations. Her object is to keep pure the type whatever it may be, and so carefully are her pre-

* See *Journal*, Vol. XI., September, 1904, and Vol. XII., June, 1905.

cautions made that, in spite of the countless millions of fertilisings taken place every year in each parish where wheat is grown, it is an extremely rare thing to find a single case of natural cross-fertilisation. The possibility of such an operation being caused by bees is so exceedingly remote that it can almost be said to have no existence. Because of its rarity, it may be as well to put on record that in the course of the Committee's work one case, or, perhaps, two, have been met with. A farmer —Mr. Richard Cook, of Box, near Bath—planted in 1902 a field with a mixture of Square Head's Master and Essex Rough Chaff, two sorts of wheat which, from the breeder's point of view, possess marked differences. When the crop matured he came across a plant with nine ears of particularly robust growth. He propagated their contents (560 grains), and has supplied the Committee with an ear of the progeny, which certainly seems to indicate that a natural cross did take place. Extremely rare though such cases of natural cross-breeding may be, it is not at all difficult to cross-breed wheat artificially, and for many years this has been done. It has always been obvious that such work results in the production of great variations.

It is known that if a male and female parent differing in four distinct characteristics were crossed we should obtain no less than eighty-one varieties, of which only sixteen would breed true, so that in the third generation, if every form of this one cross were followed up, we should require over 270 small plots. The object of the earlier cross-breeders seems to have been the creation of great numbers of variations from which they could select those likely to be of use to them, but the great difficulty was to get forms that would breed true. If, in the case mentioned, only sixteen out of eighty-one would breed true, and the breeder had no certain indication which of the eighty-one the sixteen were, the extreme difficulty of getting a sort fit for sale is obvious. Of course, by a long process of selection year by year, or even by chance in the first year, he might happen to select a form that would breed true and so be fit for introduction to the commercial world, but the value of hybridising could not be esteemed highly under such conditions. But, dating from 1901, the nature of the problem has been entirely

changed. As far back as 1865 a monk named Gregor Mendel had communicated to the Brünn Society the results of his work on the laws of heredity. Very strangely, this work was lost sight of till 1901, when three observers, working independently —De Vries, Correns, and Tschermak—simultaneously discovered its great importance. So important is it now esteemed that Mendel's laws are being applied to various investigations in both the vegetable and animal worlds. Mendel himself made many of his experiments on peas.

Mendel pointed out that plants possess some definite characteristics to each of which there is an opposite : a pair which may be called a "duality." For instance, wheat may be either beardless or bearded, red or white, the chaff may be felted (rough) or glabrous (smooth). Each "duality" can be handled by the breeder as an entity independent of other "dualities," and capable of forming fresh combinations with other dualities, so that a bearded red crossed on to a beardless white can, among several forms, provide the breeder, if he wants it, with a beardless red. One characteristic of each duality is what is called "dominant," the other "recessive," and these are reproduced in the progeny in definite ratios, each form occurring in the progeny pure—not as a blend with its opposite. To illustrate this, let us consider what happens as to beardedness or beardlessness when a bearded wheat is crossed on to a beardless one, or a beardless one on to a bearded. In the first generation, called for convenience F 1, every plant will come beardless ; there will be none bearded, hence the term "dominant" as applied to the member of each duality which comes uppermost in the first generation. In the second generation (F 2) the plants will come beardless and bearded in the ratio of three of the dominant beardless to one of the "recessive" bearded. The bearded forms are fixed as to their beardedness definitely, and will breed true as to that characteristic indefinitely, but the dominant will not. If a hundred plants raised from the F 2 wheat be taken at hazard, we shall get from this third generation (F 3) the twenty-five recessives which were definitely fixed in the second generation, and we shall find that the seventy-five dominants are sub-divided into twenty-five pure dominants which are fixed definitely and will breed true and

fifty which are mixed dominants and recessives and will not breed true, so far as we can see, at any time of their subsequent history. For practical purposes these can be discarded, and our whole attention can be fixed on the "recessive" form, if that be what we want, which we can obtain fixed in the second year, or on the "dominant," if that be the form we want, which can be obtained definitely fixed in the third year. Anyone with a mathematical turn of mind can see what complications are introduced if two parents possessing, say, six or even twelve Mendelian "dualities" are crossed, each of the six or twelve dualities giving in the third generation its 25 per cent. fixed dominants, 25 per cent. fixed recessives, and 50 per cent. unfixed forms. The calculation can be made, and the botanist making the cross can know beforehand what he will obtain, and calculate with reasonable precision, making allowance for losses by birds, killing of plants, and similar mishaps, the number of varieties he will get. One most important point is to ascertain which of the many differing characteristics of wheat are true "Mendelian" ones, and having regard to the fact that this way of regarding the cross-breeding of wheat has been considered for four or five years only, it is not at present certain whether the list is complete or definitely accurate, but a great mass of material is available, and it is believed that wheats can be bred to order.

It makes no difference to millers whether the wheat is bearded or beardless, has red chaff or white, lax ears or dense, a rough leaf surface or a smooth one, a thick hollow stem or a thin and solid one, nor, having regard to the fact that some English white wheats are quite as strong or stronger than many or any red ones, whether the colour of the bran be red or white; but all these points and many more, including immunity and susceptibility to attacks of yellow rust, are being duly considered, with the object of producing a wheat acceptable to the farmer as well as to the miller.

The all-important point is whether "strength" and its opposite, weakness, is a "Mendelian duality." As yet, sufficient material is not available to enable the point to be settled definitely as a result of milling and baking trials, but the evidence based on appearance and chemical analysis is dis-

dinctly favourable. Strength is sometimes to be found in grain which has a soft, opaque endosperm, but more commonly where the strength of wheat is to be estimated by the way it behaves when used by itself, and not in combination with other sorts, it is indicated, especially in cases where the natural moisture is approximately alike, by the possession of a hard translucent endosperm, and weakness by a soft, opaque endosperm. Mr. R. H. Biffen, the Botanist of the Agricultural Department at Cambridge University, crossed Polish (the *Durum triticum polonicum*, not the soft wheat which was sold in England as Polish wheat many years ago), on to Rivet to see the effect on the character of the endosperm. The grain produced as the result of the cross was hard. This was planted, and the grain of the first generation (F 1) was all hard, which looked as if the characteristics were Mendelian, and the hard translucent endosperm of the Polish the dominant. In the second generation of the plants (F 2), he obtained some hard, some soft, but it is not certain as yet whether they were in the Mendelian ratio of three to one. Tested by the Kjeldahl method, the Polish parent had 2·4 per cent. total nitrogen, the Rivet 1·8 per cent. The hybrids had a varying range from 2·45 per cent. to 1·72 per cent. In another case he crossed Red Fife on to White Rough Chaff, the former a relatively brittle round-berried wheat, the latter a long-berried wheat, frequently with a soft, fluffy endosperm. Two samples were sent to Mr. Humphries, who, without hesitation, declared one to be Fife and the other Rough Chaff; whereas, in fact, one was a dominant from the F 2 generation of the cross Fife and Rough Chaff, the other the fixed recessive form from the same generation. These and several other cases enable it to be said definitely that whether strength and weakness are a Mendelian "duality" or not, yet as the result of many crosses many varieties have been obtained possessing in an apparently pure form the endosperm characters of one or the other of the two parents, not a blend of both; and many hybrids are being propagated which it is believed do possess in combination the strength of the strong parents and the high yielding characteristics of the weaker parents, in the belief that they will breed true in the possession of that desired combination. The first novelty to materialise is a Rough Chaff

(Old Hoary or Taunton Buff), without the rough or felted chaff which is being pushed forward for distribution as soon as possible.

A few years ago it was thought that the crossing of a weak wheat on to a strong one would have produced progeny possessing an intermediate strength, and the most that could be hoped for would have been an improvement worth having, but of no great degree. Under those conditions, if a wheat could not be found which would maintain a great strength in England and by selection give a yield of wheat and straw satisfactory to the grower, only indifferent results could have been obtained; to-day, as hybridising has been changed from a haphazard process to a science, and as one or more wheats appear to have been found which will permanently maintain a great strength in England, the Committee believe they will succeed in producing strong wheats capable of giving high yields of grain and straw as results of hybridising, even if selection fails.

Potato Leaf-Curl.

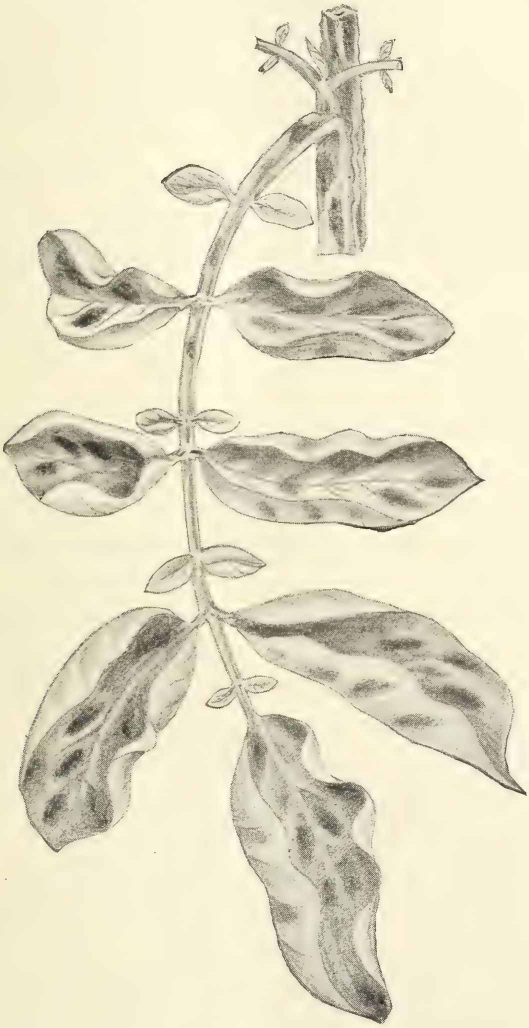
This disease (*Macrosporium solani*) is widely diffused. In addition to Britain, it occurs on the Continent, and is rampant in the United States. It has occurred on *Solanum Commersoni*, grown at Kew.

The curling of the leaves is usually the first indication of the presence of the fungus, although the base of the haulm is the portion first infected, and the curling of the leaves is due to the ascent of water and food being checked by the upward growth of the fungus mycelium in the tissues of the haulm. As the mycelium increases in quantity in the tissues, the haulm becomes limp and collapses owing to lack of water.

At a later stage, the fungus breaks through the tissues to produce its fruit, which is indicated by the presence of numerous irregular, blackish, minutely velvety patches scattered over the surface of the haulm and leaves.

—It has been found that in some instances the mycelium of the fungus passes down the haulm into the tuber. In such cases, the mycelium in the infected tuber passes into the sprout and

again produces the disease in the haulm and leaves. This, however, is not the only source of the disease, as experiments have shown that the young "sprouts" are readily infected with the spores of the fungus, and from this point of infection the mycelium extends up the haulm.



POTATO LEAF-CURL.

Neither the leaves nor the haulm above ground can be infected by the spores of the fungus. This limits the appearance of the disease to two causes:—(1) To the presence of mycelium in the tuber; by this method, new and hitherto clean areas become

infected; (2) To the presence of fungus spores in the land; this implies the previous presence of a diseased crop in the same soil.

Under the circumstances, preventive measures will consist in not planting "sets" grown in an infected area; where the disease has occurred the haulms should be brought together and burned. As the above-ground portion of the potato plant cannot be infected, spraying would be of no avail, unless, as claimed by some, spraying invigorates the plants and better enables them to combat the disease.

A dressing of kainit in the rows when the potatoes are planted would to a certain extent safeguard the crop by killing the fungus spores present in the soil at the moment of germination.

Basic Slag.

Basic slag is a by-product in the manufacture of steel, and its composition is not regulated by the manufacturer as is the case with, say, superphosphate. Iron ores contain irregular quantities of phosphorus (the substance which gives to the phosphate of lime found in bones and some other manures its value as a fertiliser), and the object of the steel-maker is to get rid of all the phosphorus in the iron. To effect this the iron is melted in contact with limestone, which extracts the phosphorus and forms a slag. This, when ground to a fine powder, is basic slag, which may vary very considerably in quality, the usual contents being 30—40 per cent. of insoluble phosphate, though there may be as little as 22 per cent., or as much as 45 per cent.

In an experiment carried out by the Agricultural Department of the University of North Wales, Bangor, in 1898 and the three succeeding years with different qualities and quantities of basic slag, it was found that the low-grade slag gave as good results as the more costly higher-grade slag, particularly where a large dressing per acre was applied. It has been maintained by Wagner, as a result of his work on basic slags, that only the phosphoric acid which is soluble in a weakly acid solution, such as a 2 per cent. solution of citric acid, is of value for manurial

purposes, and an explanation of the results obtained in the experiment above referred to may possibly be found in the fact that, although there was a wide difference in the total amount of phosphoric acid present in the high- and low-grade slags used, there might not have been so much difference in the actual quantities soluble in a weak solution of citric acid. In order to test this question further, experiments were started at two centres. The slags used in these experiments were tested both for the total amount of the phosphoric acid present and for the amount soluble in a 2 per cent. solution of citric acid and gave the following results :—

	High grade. Per cent.	Low grade. Per cent.
Total phosphate of lime	37·38	27·93
Phosphate soluble in 2 per cent. citric acid solution	30·00	26·54
Percentage passing through the standard sieve, 10,000 holes per square inch ...	71·6	72·0
	£ s. d.	£ s. d.
Price per ton	2 2 6	1 15 0

The analyses show that, although there was a difference of about 10 per cent. in the total amount of the phosphate of lime present in the two slags, there was only a difference of about 3½ per cent. in the amount soluble in a 2 per cent. solution of citric acid.

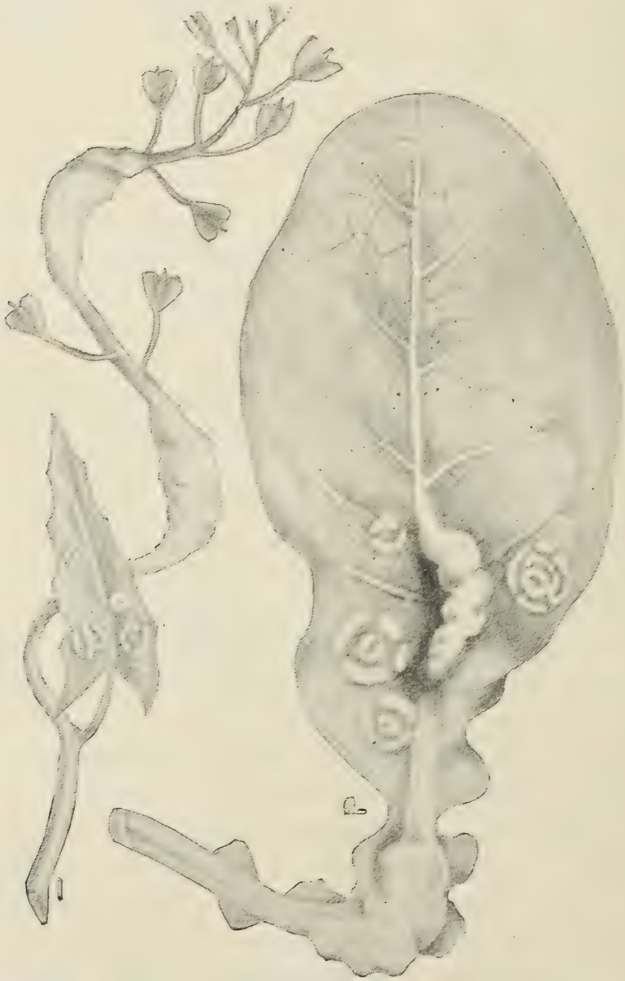
The returns from the two centres have up to the present been somewhat contradictory, but the point is one of considerable practical importance.

The Irish Department in their Leaflet dealing with basic slag, point out that there is nothing in the appearance of basic slag which gives the slightest indication of the percentage of phosphate of lime it contains, and recommend that the farmer should (1) stipulate when purchasing that he shall be supplied with a high-class slag; (2) insist on being furnished with an invoice on which are clearly stated (*a*) the percentage of phosphate of lime, (*b*) the fineness of grinding, and (*c*) the percentage of phosphate of lime soluble in a 2 per cent. solution of citric acid according to Wagner's method. There should be no difficulty in procuring from any reliable manure merchant basic slag which contains 40 per cent. of phosphate of lime and so finely ground that at least 80 per cent. of it will pass through a sieve having 10,000 holes per square inch, and in

which at least 80 per cent. of the total phosphate of lime is soluble in a 2 per cent. solution of citric acid used according to Wagner's directions.

White Rust of Cabbages.

This destructive fungus—*Cystopus candidus*—has a world-wide distribution, and attacks many kinds of plants belonging to the cabbage family—*Cruciferæ*—both cultivated and wild. In this country the various forms of cabbage, radish, and horse-radish suffer most from its presence; among wild plants the Shepherd's purse (Fig. 1) is most frequently attacked.



WHITE RUST—(1) ON SHEPHERD'S PURSE; (2) ON YOUNG CABBAGE LEAF.

On the leaves the fungus forms snow-white polished blotches, which are often grouped in irregular concentric rings (Fig. 2). These white patches break up into a powdery mass at maturity, and the spores are scattered by wind and rain. Infection takes place only during the seedling stage of the host-plant. When the stem or flower is attacked much distortion and swelling is produced, and in the swollen parts numerous resting-spores are formed, which germinate and infect seedling-plants the following season.

Diseased leaves should be removed the moment the fungus is observed, but the most important point to attend to is the collection and burning of all swollen and contorted stems and flowers, as it is the spores present in these swollen parts that infect seedlings in the spring. Shepherd's purse should be eradicated, as this weed is in the majority of instances the commonest host and primary source of infection of cultivated plants.

Live Stock Import Regulations—Victoria.*

According to the Stock Diseases Act, 1890, and subsequent Orders in Council, the following regulations apply to the importation of live stock into the Colony of Victoria from Great Britain :—

General.—The introduction of horses, cattle, sheep, and pigs suffering from catarrh, Cumberland disease, foot-and-mouth disease, glanders, small-pox in sheep, scab, pleuro-pneumonia, rinderpest, murrain, horse mange, typhoid fever in pigs, malignant or typhoid fever in horses, and tuberculosis in cattle, is prohibited. No stock may be imported into the Colony at any place other than the port of Melbourne.

All horses, cattle, sheep, and pigs desired to be introduced into Victoria, or landed for the purpose of re-shipment, shall be examined on arrival by an approved veterinary surgeon and by an inspector of stock, who, if they are satisfied that the stock are free from every infectious or contagious disease, shall grant a certificate accordingly. On compliance with certain regulations governing the landing, &c., of such stock, and on payment of a

* Live stock import regulations have been published in this *Journal* for the following countries :—Transvaal, March, 1903 ; United States, June, 1903, and Oct., 1904 ; Argentina, Jan., 1905 ; Cape Colony, Feb., 1905 ; Canada, March, 1905 ; New South Wales, April, 1905 ; Germany, May, 1905 ; New Zealand, June, 1905 ; South Australia, July, 1905 ; France, August, 1905 ; Belgium, Sept., 1905 ; and Uruguay, Oct., 1905.

deposit (Order in Council, 26th July, 1904), which varies with the number and kind of stock to be imported, the animals may be landed in quarantine. The sum deposited is applied to cover the expenses incidental to inspection and quarantine, and the balance is refunded. Food, attendance, conveyance to and from the quarantine station, must be provided and paid for directly by the owner.

If any of the stock, either before or after being landed at the quarantine station, are found to be diseased, they may be forthwith destroyed by an Inspector of Stock.

All risk in connection with the removal of any stock to the quarantine ground, and the detention and treatment thereof, or from the destruction of such stock to prevent the spread of disease, or from any other cause, must be borne by the owner of the stock, and no compensation will be paid for any loss.

Cattle and Sheep.—Any person intending to introduce cattle or sheep into Victoria shall give sixty days' notice, in writing, to the Chief Inspector of Stock, stating the kind and number of stock, the ages and sexes of the stock, and the country and place from which they are to be introduced. All such cattle or sheep, prior to their being shipped for Victoria, shall be carefully inspected by a duly qualified veterinary surgeon approved by the Governor. The exporter shall produce and deliver to the veterinary surgeon inspecting such cattle or sheep a certificate from an authorised veterinary surgeon in the district in which the animals were when sold for exportation, or from which they started for the port of shipment, to the effect:—(1) That they have been in Great Britain or Ireland for a period of not less than fourteen days; (2) that they are free from infection; and (3) that they have not within the sixty days last preceding been in contact with infection. If the veterinary surgeon be satisfied that the cattle or sheep are free from infection, and that all the other requirements of the regulations in force have up to that time been duly complied with, he shall make a declaration to that effect, and shall deliver it, together with the certificate mentioned above, to the master of the vessel. The master of the vessel and the principal attendant of such cattle or sheep during the voyage shall make statutory declarations setting out the number of animals shipped, deaths during the voyage, and particulars of the cause of such deaths. These declarations,

together with the certificate and declaration above mentioned, are to be delivered at the office of the Chief Inspector of Stock. The Chief Inspector of Stock may authorise the introduction of cattle or sheep, notwithstanding non-compliance with these regulations, in any case in which he may think that compliance with such regulations may be excused with safety.

Cattle and sheep intended to be introduced into Victoria shall remain in quarantine for a period in the case of cattle of not less than forty days, and in the case of sheep of not less than thirty days, during which time, in the case of sheep, they shall be washed, dressed, and disinfected as the Chief Inspector of Stock may direct; and, in the case of cattle, any animal suspected to be affected with tuberculosis may be subjected to the tuberculine test, and the owner, if required by the Inspector, shall render all necessary assistance to facilitate the operation. (Order in Council, 20th June, 1899.)

Horses.—After the animals have been examined by the veterinary officer on arrival and a certificate that they are free from disease has been forwarded to the Chief Inspector of Stock, they may be landed and removed to quarantine for fourteen days. The general regulations above also apply. Prior to shipment, such horses shall at the port of shipment be subjected (Order in Council 22nd July, 1902) to the Mallein test by a veterinary surgeon (at one of the ports of London, Liverpool, or Glasgow) appointed by the Governor, and shall be accompanied by a certificate from such veterinary surgeon, stating that the said horses have been duly tested with Mallein and found to be free from glanders.

Pigs.—The introduction of swine into Victoria from Great Britain is permitted (Order in Council, 20th June, 1899) subject to compliance with the general regulations stated above and to thirty days' quarantine.

Butter Tests.

For many years past the British Dairy Farmers' Association, the English Jersey Cattle Society, and kindred bodies have been conducting tests to ascertain the value for butter production of the milk of various breeds of British cattle. These tests are usually conducted in connection with the annual shows of the various Societies, and hence they are limited in duration, and the cattle

being in new and unfamiliar surroundings frequently give milk of quite an abnormal character.

When the Somerset County Council started their County Farm at Bickenhall in 1900, it was decided to conduct such tests with two breeds of cattle, viz., Jerseys and Shorthorns, and these tests have been carried out continuously for a period of four years. During the first year of the tenancy, the tests were made monthly, but since then they have been conducted fortnightly. In all, eighty-six tests of this nature have been made. During the last two years, similar tests have been made with the North Devon breed of cattle, the total number of such tests being twenty-five. The following table shows the average number of pounds of Jersey, Shorthorn, and Devon milk which in each year have been required to produce 1 lb. of butter. The averages for the whole period are also shown :—

Year.	Shorthorn.	Devon.	Jersey.
	Lb.	Lb.	Lb.
1900–1	25·03	—	19·94
1901–2	27·13	—	18·89
1902–3	28·39	—	19·92
1903–4	28·19	23·40	18·27
1904–5	26·95	23·81	17·83
Average for all ...	27·92	23·50	19·09

The average figures are not very dissimilar from those obtained in public trials, though they are slightly more favourable, but the fact that the cows are under settled conditions would conduce to such a result. In the table which follows are shown the largest and the smallest quantity of milk of each breed required to produce 1 lb. of butter :—

Date.	Shorthorn.		Devon.		Jersey.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1900-1	29·7	22·53	—	—	22·00	19·75
1901–2	41·02	20·00	—	—	25·00	15·68
1902–3	39·02	22·53	—	—	23·53	16·33
1903–4	33·1	20·87	25·81	18·82	21·82	16·84
1904–5	30·00	25·26	24·61	22·86	18·46	16·16
For whole period	41·02	20·00	25·81	18·82	25·00	15·68

It will be seen that the ratios obtained vary very widely, 20 lb. of Shorthorn milk sufficing at one time to yield 1 lb. of butter, while at another no less than 41 lb. were required. In the same way something under 16 lbs of Jersey milk yielded 1 lb. of butter in November, 1902, while in August of the same year 25 lb. of milk were needed. Although some very bad ratios were obtained during the hot weather, when, ice or cold spring water not being available, a certain amount of the butter was not recovered, yet, generally speaking, the worst ratios were obtained during the winter months, when the cattle were indoors and living on artificial food. All recent work on the analysis of the milk yielded by the same cows goes to show that the daily variation in composition is very marked, and that it is quite impossible to explain such variations by reference to feeding or external conditions. It would therefore be expected that the amount of butter obtained from a given quantity of milk would vary in like manner, and the experiments at Bickenhall bear out in a striking way the wide variations in composition found by other experimenters to exist.

Butter Tests with Mixed Milk.—Although the milk of each breed was separately tested, the bulk of the butter was of course made from the mixed milk of both breeds. Where two milks of varying quality are mixed in this way, one would expect that the quantity of butter obtained would hold some intermediate position between that which would be obtained from the milks churned separately. An interesting point arose as to whether the quantity of butter obtained would vary exactly, according to the quantity of each milk used, or whether it would obey some independent law of its own ; in other words, would the amount of butter obtained from two given quantities of milk mixed before churning, be equal to the sum of the butter obtained from the same milk if churned separately, or would the addition of the richer milk to the poorer influence the mixture in such a way as to give more butter than if they were churned separately ? Much time and attention has been given to the elucidation of this problem. The first experiment designed to throw light upon it was started in November, 1901, and continued till March, 1903. It consisted of a series of monthly tests, in which Shorthorn and Jersey milk were mixed in the

following proportions, viz.:—(1) 80 per cent. Shorthorn and 20 per cent. Jersey; (2) 60 per cent. Shorthorn and 40 per cent. Jersey; (3) 50 per cent. Shorthorn and 50 per cent. Jersey; (4) 40 per cent. Shorthorn and 60 per cent. Jersey; (5) 20 per cent. Shorthorn and 80 per cent. Jersey, and the amount of butter obtained from the various mixtures separately determined. It appeared that some gain resulted in each case from the mere process of mixing, but the greatest gain resulted where 20 per cent. of Jersey milk was employed.

The results obtained were not considered reliable for the reason that in order to get a sufficient quantity of milk the tests had to be spread over three days, and to determine the advantage or otherwise of mixing, the figures obtained had to be compared with those of the ordinary fortnightly tests, which were conducted at other and quite different dates. We have already seen how very widely the butter-yielding capacity of milk varies. Figures obtained on one series of dates cannot therefore be properly compared with those obtained on other dates. To eliminate this source of error the method of conducting the tests was altered as follows:—On the same day that the ordinary fortnightly tests were conducted, and from the same milk, two mixtures of Shorthorn and Jersey milk in the proportions of (1) 90 per cent. and 10 per cent., and (2) 80 per cent. and 20 per cent. respectively were made. The amount of butter contained in each mixture was then separately determined.

These results could properly be compared with those obtained from Jersey and Shorthorn milk churned separately, as all the tests were conducted with Shorthorn and Jersey milk showing the same composition. These tests were continued fortnightly from April 7th to October 6th, 1903. As a result of the fourteen tests it was found that from 38½ gallons of milk mixed in the proportion of 90 per cent. of Shorthorn and 10 per cent. of Jersey, there were obtained 2½ oz. more butter than if the milk had been churned separately, and where 80 per cent. of Shorthorn and 20 per cent. of Jersey milk were used a gain of 7½ oz. of butter resulted from the use of 38½ gallons of milk.

Acting on these results, it was decided to institute a series of daily butter tests to be continued for a fortnight. The milks

taken were:—(1) 30 lb. Shorthorn milk, (2) 30 lb. Jersey milk, and (3) 24 lb. Shorthorn and 6 lb. Jersey milk mixed—that is, 80 per cent. Shorthorn and 20 per cent. Jersey milk. The butter in each was separately determined after the cream had been allowed to ripen two days. These tests were conducted from October 22nd to November 4th, 1903, from February 11th to 24th, from June 3rd to 16th, and from August 25th to September 7th during 1904. Each test was conducted on exactly the same lines, so that the four tests are strictly comparable.

In the following table the total weight of butter made during the fourteen days that each test was in progress is shown, together with the estimated gain from mixing 24 lb. of Shorthorn with 6 lb. of Jersey milk before churning, as compared with churning these quantities separately. The weight of butter produced as an average of the four tests and also the average estimated gain from mixing are also shown. On reference to the table it will be seen that the estimated gain from mixing varies widely, being so little as 1·6 oz. of butter at the first test, and as much as 1 lb. 3 oz. at the second test, the average gain from mixing being 9 oz. In every case, however, there is *some* gain from mixing, which would naturally vary according to the period of lactation of the cows under experiment and other varying factors met with in the course of the year:—

No. of Test.	Date of Test.	Total Weight of Butter in Lb. and Oz.			Gain from mixing.
		Shorthorn.	Jersey.	Mixed.	
		Lb. Oz.	Lb. Oz.	Lb. Oz.	Lb. Oz.
1.	Oct.–Nov., 1903 ...	18 1½	25 11½	19 11½	1·6
2.	February, 1904 ...	16 0	22 1½	18 6½	1 3
3.	June, 1904 ...	15 14	23 12	17 12½	5·3
4.	August, 1904 ...	17 14½	25 10½	20 1½	10·2
	Average of all Tests ...	16 15½	24 5	19 0	9

During the total period that the four tests were in progress 76 lb. of butter were obtained from the mixed milk, and this showed a gain of 2 lb. 4 oz. of butter, resulting from the mere process of mixing together two different milks, or a gain of about 3 per cent.; that is to say, in a dairy where 100 lb. of

butter per week were being made from the milk of Shorthorn and Jersey cows in the proportion of 80 per cent. Shorthorn to 20 per cent. Jersey milk, 3 lb. per week more butter would be obtained from these milks if mixed than if they were dealt with separately.

As in every experiment tried there has resulted some increase in weight of butter from the churning together of Shorthorn and Jersey cream over what would have been obtained if the creams had been dealt with separately, and as moreover the gain was in some of the tests fairly substantial (amounting to more than 6 per cent.), it is safe to conclude that such a procedure is to be recommended, and that those farmers who keep a few Jerseys among a herd of ordinary Shorthorns or Crossbreds for butter-making are not only improving the texture and colour of their butter, but are actually getting a larger proportion of butter out of the milk.

Dairy Show at Chicago.

With reference to the National Dairy Show, which is to be held at Chicago from the 15th to the 24th February next,* in connection with the Twelfth Annual Convention of the National Creamery Butter Makers' Association, the Board have received through the Board of Trade a letter from the British Consul stating that two-thirds of the space available for exhibits has already been sold, but that no applications have been received from any British exhibitors. The Secretary of the show believes that it would pay some of the manufacturers of dairy machinery, &c., in England to send their goods, as everything used by the dairy farmer and by creameries and cheese-makers will be shown, and the British Consul regards this show as a valuable opportunity of bringing British cheese before the American public. The duty on cheese and butter, it may be mentioned, is 3d. a pound.

Goods for exhibition will be received at the Coliseum Building on February 12th, 1906, at 8 a.m., and the stands, &c., for exhibition must be complete by February 15th, 6 p.m., and all

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* *Journal*, September, 1905, p. 175.

goods, stands, &c., must be removed by 6 p.m. on February 26th. The rate for space is 1 dollar per square foot, except corner spaces, which are $1\frac{1}{4}$ dollars per square foot. The most general size of the stand space is about 10 ft. by 10 ft. and 10 ft. by 12 ft. A deposit of 25 per cent. is payable on application, and the balance on February 1st.

Applications should be addressed to the National Dairy Show Association, 154, Lake Street, Chicago, and as the space now remaining is limited it is desirable that it should be reserved by telegraph. The British Consul, Mr. Alexander Finn, would be happy to render assistance to intending exhibitors.

A copy of the form of application with a plan of the building and other particulars can be seen on application to the Intelligence Branch, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.

Experiments with Apple Trees.

The records of the experiments on apple trees at the Woburn Experimental Fruit Farm now cover a period of ten years, which is nearly one-half of the profitable life of the dwarf trees. The experiments with manures were dealt with in the Fourth Report of the Farm,* and in the Fifth Report the Duke of Bedford and Mr. Spencer Pickering discuss the experiments dealing with the treatment of the trees in other respects.

Variations in the Size of the Fruit.—The behaviour of dwarf and standard apple trees during the first ten years since they were planted has been examined by measuring the size of the leaves, the size of the trees, the weight of the crops, and the average size of the fruits. It would appear that the average size of the leaf of the tree diminishes more or less regularly throughout this period, and the average size of the fruit probably does the same, but it shows greater irregularities than that of the leaves, being much more affected by the character of the season. When a tree is allowed to overbear, or when the number of fruits in each truss is excessive, the size of the fruit will suffer; but, except in these extreme cases, it

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* See *Journal*, January, 1905, p. 625.

would appear that the average size of the fruits is not affected by the heaviness of the crop, so that any excessive thinning of fruit will secure no advantage in the size of that left on the trees. Three different classes of cases were examined where the influence of weight of crop on the size of fruit should have been apparent, if any existed ; but they all showed an absence of any such influence. This observation, however, refers to apples only, and also to varieties of apples which thin themselves fairly well.

Cutting Back.—The effect of cutting back at once on planting, or deferring that operation till after the first year's growth, may depend to a certain extent on the character of the subsequent seasons, but in most cases it will probably result, as it did here, in showing a considerable balance in favour of immediate cutting back. The time of cutting back did not affect the ultimate size and vigour of the tree, but there was a large loss of fruit in cases where the cutting back was deferred, owing to vigorous growth having followed that operation when performed, and having prevented the formation of fruit buds during the second and third years.

Pruning.—The general results obtained in experiments on pruning trees to different extents have been somewhat surprising. There would appear to be no very certain effect on the leaf-size whether a tree is pruned hard or not pruned at all, and hard pruning certainly appears to be inimical to the general growth of a tree, even when we measure that growth by a feature such as the girth of the stem, and take no account of the spread of the branches or the height of the stem. It is in the crops, however, that the absence of pruning appears to the greatest advantage, for the trees which were unpruned bore crops of three times the value of those which were pruned heavily, and 50 per cent. greater than those which were pruned moderately. The increased value depended nearly entirely on the increased weight of crop in these cases ; but it is specially noticeable that the absence of pruning did not, on the average, diminish the size of the fruits. The unpruned trees, also, are by no means so straggling and unshapely as might have been anticipated. It must be remarked, however, that an absence of pruning would probably produce less favourable results in the

case of varieties which were very precocious, and, consequently, were weak growers, and in no case, on the strength of the results at present obtained, would the omission of such pruning as may be necessary to shape a tree properly and prevent its branches from crossing and rubbing be advocated.

Incidentally it has been noticed that although a tree which is not pruned is much larger at first than a pruned one—as regards the extension of its branches — this superiority diminishes in time, the unpruned trees being now very little larger than the pruned ones. There also appears to be a sinking of the tree into the soil as it grows.

Summer pruning, shaping, or pinching, seem to have been followed by no good results in the case of the trees at Woburn, but rather the reverse, and such treatment is not, therefore, recommended. It may be successful in some seasons, but, generally, it results only in the growth of weak, unripened wood, which has to be removed in the following autumn.

Pruning at different times of the year, between the fall of the leaf and the ensuing spring, has been investigated in the case of a mixed plantation, and the results show that there is nothing in favour of doing the pruning at one time rather than another, nor have any evil effects been observed to be produced by pruning during the severest weather.

Root Pruning.—The extent to which root pruning checks the growth of a tree is illustrated in several of the plots. Root-pruning every year practically stops all growth, and the trees thus treated are now moribund. When the root pruning is performed less frequently the effect is proportionately less, and recovery, accompanied by relatively heavy cropping, begins in the second year after the operation. The mere replanting of a tree, if performed without injury to the roots, does not appear to affect it at all; but injury cannot be avoided if the tree is above a certain size, and, in the case of the tree being exposed for some time before it is replanted, the injury appears to be very material, the tree receiving a check from which it never recovers, or, at least, does not do so within the next nine years.

Transplanting.—The age at which a tree will best bear transplanting has been investigated in the case of bush apples and

pears, and of standard apples and plums. With the bush trees, transplanting at two or three years of age yielded much better results than transplanting at one year or four years. The two-year trees, on the whole, did better than the three-year trees, and, considering the difference in cost between them, they are decidedly to be preferred for planting. With standard trees, those of two and four years alone were tried, and the younger trees in this case also did much the better. For estimating the results obtained in these cases the values of the crops borne during the first ten years after planting were taken.

Effect of Grass.—The general effect of grass and weeds on apple trees were dealt with at length in the Third Report of the Station.

At present no difference has been found in the action of different grasses on apple trees. The experiments on grassing over pears, cherries, and plums immediately on planting have led, so far, to the same result as in the case of apple trees, the check given to them being very severe.

Effect of Iron in the Soil.—Experiments in which soluble salts of iron and manganese were applied to the soil led to the conclusion that neither of these metals have any effect in producing a highly coloured fruit, as is often stated to be the case.

Planting in Trenched and Untrenched Ground.—The results obtained on planting trees in trenched and untrenched ground proved that the latter has been more successful at this station, the advantage showing itself in the much heavier crops obtained. Although this result may be at variance with general experience, there would seem to be nothing astonishing in the fact that where the sub-soil is a stiff, unkind clay, anything which would induce the roots to penetrate into it, as trenching would, might be injurious to the tree. That this is probably the explanation of the results is borne out by the fact that similar good results have been obtained by preventing the roots from penetrating into the clay by having a layer of chalk under them.

Deep Planting.—It was found that when trees were planted at a great depth in the soil, there was the same dying off of the old roots and development of new ones, whether the sub-soil or the surface soil was placed in contact with the old roots, the

distance from the surface and not the character of the soil contiguous to the roots being the dominant factor in their development. But if the new roots had to develop in a medium of clay, they did not do so as freely, and the growth of the tree was less.

Planting trees slightly too high or too low—to the extent of four inches—has not made any difference in the results obtained ; the trees seem to have adjusted themselves to the normal level.

Physical Character of Soil.—The mixing of chalk, flints, or gravel with the soil on planting produced no appreciable effect on the trees at Woburn. A similar admixture of peat or compost improved the vigour and growth of the trees, especially at first, and with the compost the crops have been considerably above the normal. It is believed that this beneficial action is due chiefly to the physical alteration in the soil produced by these substances rather than to the manurial matter contained in them.

Times of Planting.—Planting trees at various times between November 28th and March 3rd resulted in no difference in the trees ; but in another series, where the times ranged from October 30th to April 16th, it was found that very early planting was advantageous, at any rate in cases where the trees can be planted at once after having been lifted. Unfortunately, such early planting is rarely possible, and no difference seems to be made by planting at times ranging from the end of November to the middle of April. Late planting, however, should generally be avoided, as there is greater risk then of getting roots dried up during removal.

Watering Trees.—Watering trees during the period of growth has been tried for four years in certain plots, but no results, good or bad, have been produced up to the present.

Removal of Blossoms.—The removal of blossoms from a tree for several years after it has been planted produces very advantageous results in some cases, the trees being benefited as regards their growth, and the crops eventually obtained being much in excess of those from trees which had not been disblossomed. The trees appear to bear heavy crops for many years afterwards, and not only in the year when they were first allowed to bear. This advantage is greatest in the case of pre-

cocious varieties; with shy bearers no good results are likely to follow.

With apple trees, during the first five or six years after planting there appears to be a tendency for individual trees to bear well or badly for several years in succession, but as the tree gets older an opposite tendency manifests itself, and then, as a rule, a tree which bears well or badly in one season will bear in the reverse way the next season.

"White Rot" of Vines.

The fungus called *Coniothyrium diplodiella*, or "White Rot" of Vines, was described in this *Journal* in October, 1904, and it was mentioned that during recent years it has frequently been met with on vines growing under glass in this country. This account may be usefully supplemented by the drawing on the next page, which illustrates the disease attacking the fruit and the stalk.

The fruit is the part most frequently attacked, and in severe cases the fungus spreads from the stalk of the bunch of fruit to the branch from which it springs; the foliage is never attacked. When once established, the disease spreads rapidly, and usually every grape on a bunch becomes diseased, owing to the numerous minute spores of the fungus being conveyed by rain, syringing, &c., from diseased to healthy berries. During the first stage of disease the berries become pale brown in colour, and soon commence to shrivel, but do not fall. At a later stage, when the shrivelled berries have become dry, the skin assumes a dull silvery appearance, and is covered with minute whitish pimples representing the fruit of the fungus.

When the stalk of a diseased bunch is attacked, the fungus often extends to the supporting branch, where it forms slightly depressed areas, which are at first brownish in colour, but afterwards studded with the characteristic white pustules of fungus fruit. The diseased patches may extend for several inches down one side, or the branch may be completely girdled by an irregular zone of diseased tissue, and if this is the case that portion of the branch above the injured zone soon dies. In vineyards the disease is most injurious during seasons of great humidity accompanied by warmth. Under such conditions

one-quarter to one-third of the crop may be destroyed within the space of a few hours.

The best remedy is to remove and burn all diseased bunches of fruit, and spray every part thoroughly once every five days with a rose-red solution of permanganate of potash. If the disease is of recent origin and confined to the bunches of fruit, the above treatment will suffice.

"WHITE ROT" OF VINES.

If, however, the disease has spread to the branches, its presence will be indicated by the slightly depressed pale-coloured patches on the bark already mentioned. All such diseased branches should be cut out, as spraying will not check the disease on permanent parts of the vine, where the mycelium of the fungus spreads rapidly in the tissues.

Where the disease has existed, every part of the vines, and

the soil, walls, glass, &c. should be thoroughly drenched with a solution of 1 lb. of sulphate of copper dissolved in 25 gallons of water. This dressing should be applied during the winter before the leaf-buds begin to swell, otherwise the foliage will be destroyed.

Fumigation with Hydrocyanic Acid Gas.

The use of hydrocyanic acid gas for fumigating young fruit trees has been recommended during the past few years, and its value as a remedy for mussel scale is well known. In the Board's Leaflet No. 34, "The Woolly Aphis," the suggestion is made in reference to young apple and pear trees that all nursery stock should be fumigated with hydrocyanic acid gas, and thus thoroughly cleared of all insect pests before planting. In some countries, *e.g.*, British Columbia, New Zealand and Cape Colony, the fumigation of imported plants is required by law.

Full directions as to the method of treatment are given in Leaflet No. 107, from which the following extract may be quoted :—

"The bushes or young trees should be placed in an air-tight box or canvas tent of known capacity and subjected to the fumes of hydrocyanic acid gas for one hour. Large numbers can be treated at once at little expense. After the stock is stacked under the tent or in the box a glazed earthenware jar (never a tin or iron vessel) should be placed on the floor and then water poured into it. Sulphuric acid is added to the water and cyanide of potassium allowed to fall into the jar.

"The acid used should have a specific gravity of not less than 1·83, and the cyanide should be of 98 per cent. purity. The proportions to be used, even with these standard materials, will vary according to the character of the season, the strength of the plants to be treated, and whether the plants are dormant or active, evergreen or deciduous, &c.

"For 150 to 200 cubic feet of air space the following general formula may, however, be given :—1 oz. of potassium cyanide, $1\frac{1}{2}$ fluid oz. of sulphuric acid, and 3 to 4 oz. of water, the

"strengths" being as above. The proportions can be reduced or increased according to the space to be fumigated. Put very generally the proportions may be stated thus:—The amount of acid in fluid ounces to be one-half more than the cyanide, and the water to be double the amount of acid.

"It must be remembered that both the gas and the cyanide of potassium are deadly poisons. The fumes must not be breathed. The cyanide of potassium, wrapped say in a paper bag, is lowered into the acid by a mechanical arrangement worked from the outside. Or the apparatus may be arranged so that the acid is poured into a jar containing the cyanide.

"The process may also be applied in the case of green-houses.

"At the end of an hour the tent or greenhouse should be opened in such a way that the wind blows the fumes away from the operator, and should be left to ventilate for half an hour before the stock is removed."

As the practice is not, perhaps, so largely adopted in this as in some other countries, the following* summary of an article by Mr. Claude Fuller, the Natal Government Entomologist written for the guidance of those who wish to undertake orchard fumigation with this gas, may be useful as supplementing the information given above.

It is stated that although the treatment may not lead to the entire eradication of some of the more persistent scale insects, it appears to be the most economical and effective way of dealing with them. In the case of mussel scale it is recommended that the fumigation should be followed by spraying, as the gas, whilst killing the live insects, cannot be relied upon to destroy all the eggs, so that the trees may again become infested.

Fumigation is effected by first covering the trees with comparatively air-tight canvas covers, and exposing them to the fumes of hydrocyanic acid gas. The materials required consist of covers for the trees, the necessary chemicals, jars, measures, &c. The covers should be of light, durable material, sufficiently gas-tight, the most suitable probably being canvas. Eight-ounce duck canvas is recommended. There are three types of covers:

* *Natal Agricultural Journal*, July 28th, 1905.

sheets, tents, and box covers. The first are octagonal in form, and can be further enlarged by sewing on a "skirt" round the edge. These can be easily lifted over small trees up to six or seven feet in height, above which a hoisting apparatus must be used. Tent covers may be used for trees up to 13 feet in height. They take the form of dome-shaped tents, the mouth of which is kept open by a ring of gas-piping passed through canvas loops, and they can be quickly lifted over and removed from 8 to 13-ft. trees by a couple of men. Box covers are made to any convenient size by covering a wooden framework with canvas or calico; the latter material should be painted or oiled to make it sufficiently gas-tight. They are especially adapted for small trees and bushes.

The potassium cyanide may be used in lumps about the size of cube sugar, and placed in a china basin or glazed earthenware bowl. It should be placed well under the cover, after which water and commercial sulphuric acid are added. It is recommended that equal weights of cyanide and acid should be used, and twice as much water as acid, *i.e.*, one part of cyanide, one part of acid, two parts of water. The cyanide should be of 98 per cent. purity. As soon as the acid is added the side of the cover must be quickly lowered and made tight, in order that the gas may not escape.

The time of exposure for small trees is put at 30 minutes, and for trees over 10 feet from 40 to 45 minutes. Under no circumstances should the cover be removed until 30 minutes have elapsed. As to the quantities of acid and cyanide used in generating the gas, trees 6 feet high and 4 feet in diameter when covered, enclose 65 cubic feet of space, and for such trees $\frac{1}{2}$ oz. each of cyanide and acid and 1 oz. of water may be used. For trees 8 feet by 6 feet the space is roughly 200 cubic feet, and the quantities should be $1\frac{1}{2}$ oz. each of cyanide and acid, and 3 oz. of water.

The potassium cyanide, being very poisonous, should be kept in tightly stoppered bottles and labelled *Poison*, whilst the gas as generated must on no account be breathed. Fumigation should not be carried out in a high wind, nor when the trees are wet, but otherwise can be done at any season of the year, most opportunely perhaps directly the crop is removed.

Gall-Gnats Injurious to Osiers and Willows.

The Gall-Gnat family, or *Cecidomyidæ*, is a family of two-winged or dipterous insects. These flies are tiny, delicate in structure, and with few nervures to the wings; their somewhat long antennæ have, typically, whorls of fine hairs at the joints; the legs are long and slender; the hairs on wings and body are easily rubbed off. The larvæ are small maggots, and some have at the front end, on the lower surface of the body, a so-called anchor-plate or "breast bone," which may be used for leaping or for changing position, or, perhaps, in feeding.

The food habits of the larvæ vary considerably, but all the willow-infesting species are found in characteristic galls or malformations, the galls being on young or older twigs, at the apices of twigs, on flower buds, and on leaves.

The pupal stage is generally in the gall, but in some cases in the soil.

Cecidomyia (*Rhabdophaga*) *saliciperda.*

This species infests *Salix alba*, *S. fragilis*, *S. caprea*, *S. purpurea*, *S. viminalis*, and exceptionally White Poplar. Young twigs are attacked, and parts up to 3 or 4 in. in diameter.

Symptoms of infestation are poor leafage, swellings, and later the rupture of the bark, which hangs down in shreds.

Description of Insects.—The fly measures only 2 to 3 mm. in length; its head and thorax are black or black-brown, with black hairing; the wings are milky white, with whitish hairs. The extremely minute eggs, rounded at the ends, are orange yellow in colour. The larvæ are rounded at both ends or somewhat spindle-shaped, and have a well-marked anchor-process. The pupa is yellow, and has at the base of the antennæ two small brown projections.

Life History.—The female lays her eggs in chains or rows on the bark. The larvæ on hatching bore into the bark, and owing to their irritating presence the cambium gives rise to irregular streak-like growths, through which the larvæ make excavations or irregular galleries. Between the larval galleries the wood is normal in condition. Perhaps the activity of the cambium may serve to enclose the larvæ without marked boring on their part.

For a time the bark stretches, accommodating itself to the thickening, so that only spindle-shaped swellings show, but ultimately it ruptures and hangs down in shreds. For pupation the larva betakes itself to the periphery, pupation taking place under only a thin epidermis, which is easily knocked through by the two forehead horns of the pupa.

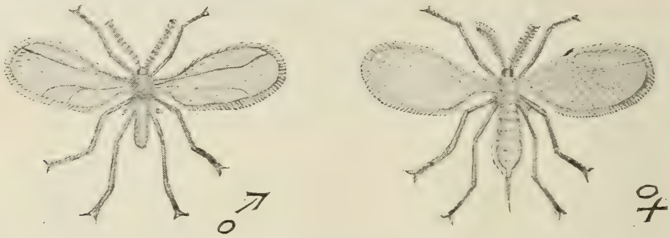

FIG. 1.—Cecidomyia saliciperda (magnified). After Nitsche.

After issue of the adult gnats the bark may be seen riddled with small holes. There is one generation in the year, the larvæ tunnelling from July till the next April, May, or June.

Preventive and Remedial Measures.—1. Cut off and burn infested shoots before issue of the adults.

2. Cut out infested pieces and burn.

3. Streak over with tar the places attacked, as, though the pupæ may occasionally push themselves through this, the flies will be entangled in the sticky material.

Cecidomyia (*Rhabdophaga*) *salicis.*

This gall-gnat is the cause of spindle-shaped or lemon-shaped galls on the one-year twigs of *S. cinerea*, *S. caprea* *S. purpurea*, *S. aurita*, and *S. viminalis.*

Both leading and side shoots may be infested. The twigs fail to grow, they may become angled and are rendered useless for basket-making or wicker-work.

The galls are caused by an enlargement of the pith.

Description of Insect and Life History.—The flies—black, with two stripes of white hairs—measure less than 6 mm. in spread of wings. They lay their eggs in little heaps, and in the multilocular gall the yellow-red larvæ may be found, in number up to thirty. Pupation takes place just below an outside skin, which is broken through for the exit of the adult gnat. The issue of the adults may take place from the end of May onwards.

The remedial measure is to cut away and burn the galls before the flight of the adults.

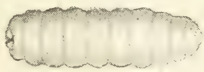

Fig. 2.

Fig. 4.

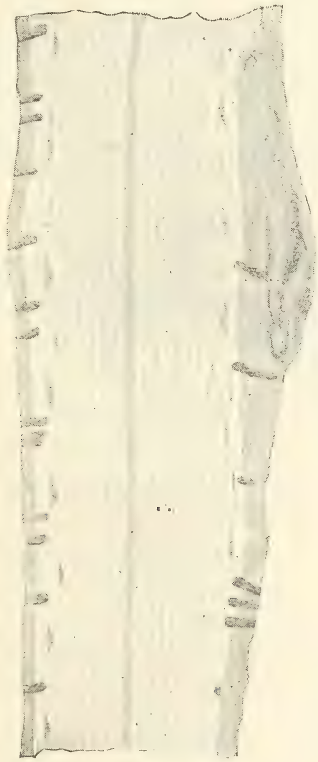

Fig. 3.

FIG. 2.—Larva of *C. saliciperda*, after preservation, greatly magnified. FIG. 3.—Longitudinal section of *Salix alba*, showing larval tunnels of *C. saliciperda*, natural size. FIG. 4.—Piece of *Salix alba*, showing flight holes of adult *C. saliciperda*, natural size.

Cecidomyia (*Rhabdophaga*) *rosaria.*

The galls of this insect are typical of a series, where, owing to the malformations at the ends of the twigs, the normal increase in length is hindered. The galls of *C. rosaria* are rose-shaped, and are found at the ends of the shoots of *S. caprea*, *S. aurita*, *S. alba*, *S. purpurea*, and *S. cinerea.* The fly is black, with greyish wings, and has silvery hairs on the thorax.

In late spring or early summer the egg is laid in the developing terminal bud, and the internodes failing to develop the leaves remain drawn together in a rosette.

When the other leaves fall in autumn, those of the gall remain—brown and withered looking. Pupation takes place in the gall.

Cecidomyia (*Dasyneura*) *terminalis*.

This brown-black fly is the cause of the swollen galls at the apices of the shoots of *S. fragilis*, and *S. alba*.

As many as twenty to thirty larvæ may be found in the gall.

FIG. 5.—Galls of *Cecidomyia heterobia* on *Salix triandra* (two-thirds natural size).

Cecidomyia (*Rhabdophaga*) *heterobia*.

This gall-gnat is the cause of the rosette galls at the apices of the shoots of *S. triandra*, and *S. cinerea*, and of the galls on the male catkins of *S. amygdalina*. The infested catkins are deformed, while the presence of the orange-coloured larvæ at the apices of the shoots prevents shoot development.

The gall-gnat is dusky-brown to black in colour, with the under surface of the abdomen yellow. The damage can be great.

Last year I had both from England and from Ireland examples of the damage of this insect sent to me. One observer wrote me from Ireland: "Our best brown-skin osiers are attacked, the best osiers for wicker-work; the green-skinned varieties are not attacked, but even isolated shoots of the brown growing among the green are attacked." The whole crop in this case had to be cut down. The trade names of the attacked osiers were Norfolks (chiefly), Black Mauls or Mules, and Spaniards—these all being varieties of *S. triandra*. I bred out from the galls during the summer many flies and also some parasites of the gall-gnats. Pupation takes place in the gall.

The remedial measure is to cut away the galls and burn the enclosed brood.

Cecidomyia (*Dasyneura*) *marginem-torquens*.

This gall-gnat may be mentioned as a type of those that make galls on leaves. The galls are at the edges of the leaves, and, as there may be many alongside one another—one larva to each gall—the leaf edges are rolled. *Salix viminalis* is a favourite host plant, but *S. fragilis* may be infested, and there is a record of attack on *S. caprea*.

R. STEWART MACDOUGALL.

International Exhibition at Milan.

The International Exhibition to be held at Milan from 15th April to 15th November, 1906, will include sections relating to Agriculture and Stock Raising. There are 109 classes for agricultural machinery, implements, and appliances of all kinds, thirty classes relating to Agricultural and Forestry Education, fifty classes for agricultural products, including manures, and a number of classes for live stock of all kinds. Copies of the programme and further information can be obtained from Mr. Arthur Serena, Hon. Executive Commissioner of the British Commission for the Milan Exhibition, 8, Austin Friars, E.C.

Notes as to Agricultural Machinery Abroad.

Mr. C. S. Smith, H.M. Consul-General at Odessa, gives useful information respecting the demand for agricultural machinery in Russia. He also mentions that there would seem to be a good opening for a machine which would take straw as it comes from the thresher, reduce it to short pieces, and bruise it thoroughly, so that when mixed with a small proportion of barley or other grain it would form a suitable fodder for sheep, working oxen, &c. The bruiser ought to be designed for attachment to the thresher, so that the whole process of threshing and bruising may be effected at once. A German bruiser has already been put upon the market this season. It is said to be able to deal with the amount of straw delivered by a 4·6 drum-thresher, the thresher and bruiser being driven together by an 8 horse-power engine.

A suggestion is also made in this Report respecting the demand for vegetable and flower seeds. (*F.O. Report, Annual Series, No.* 3,480.)

Suggestions by the British Consul at Moscow as to the importation of agricultural machinery into Russia are also given in another Foreign Office Report, Annual Series, No. 3,441.

The British Vice-Consul at Philippeville, Algeria, reports that a considerable number of ploughs of American or Canadian make are imported from France, and suggests that there is an opening in this direction for British makers. (*F.O. Report, Annual Series, No.* 3,479).

Recent Issues of Leaflets.

The following leaflets have been issued since the previous notice in the *Journal* (June, 1905), and single copies may be obtained free of charge on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

"Advice to Beginners in Bee-Keeping" (No. 128); "A Mushroom Disease" (No. 139); "The Felted Beech Coccus" (No. 140); "Calf-rearing" (No. 142); "The Turnip Mud Beetle" (No. 143); "Sheep Dipping" (No. 145); "Tests for Farmer' Milk" (No. 146); "Fences and Hedges" (No. 147); "Planting Fruit Trees and Bushes" (No. 148); "Threshing of Barley" (No. 149); "Cleanliness in the Dairy" (No. 151); "Bacterial Disease of Tomatoes" (No. 152); "Storing Turnips" (No. 153); "Prevention and Cure of Sheep Rot" (No. 154); "Larch Canker" (No. 155).

The set of leaflets No. 1-100 are issued bound in stiff boards, price 6d. post free, and the whole series up to recent numbers may be obtained, arranged in eight sectional volumes according to subject, bound in paper covers, price 1d. each, post free.

Sums of 6d. and upwards should be remitted by Postal Order.

ADDITIONS TO THE LIBRARY DURING OCTOBER.

Africa—

Department of Agriculture, Natal:—

Notes on Agriculture in Natal. (79 pp. + 50 illustrations.) 1905.

Bull. VIII. Agricultural Co-operation. (11 pp.) 1905.

Cape of Good Hope.—Government Botanist and Curator. Report 1904–5. (8 pp.)

Australasia—

New Zealand.—Department of Lands and Survey. Report for 1904–5. (112 + 81 pp.)

Queensland.—Department of Public Lands. Report for 1904. (82 pp.) 1905.

Queensland.—Statistics of the State of Queensland for 1904. (456 pp.) 1905.

Western Australia.—Bluebook for 1904. (112 pp.)

Germany—

Endres, Dr. Max.—Handbuch der Forstpolitik. (823 pp.) 1905.

Hæsch, F.—Der Weidebetrieb in der Schweinezucht. (110 pp.) 1902.

Great Britain—

Nisbet, J.—The Forester. 2 vols. (506 + 642 pp.) 1905.

Watkins, W. E., and *Sowman, A.*—School Gardening. (103 pp.) 1905.

Ashley, P.—English Local Government. (190 pp.) 1905.

"*Home Counties.*"—Poultry Farming. (186 pp.) 1905.

Stapleton-Cotton, R.—Cottage Gardens. (62 pp.) 1905.

Edinburgh & East of Scotland College of Agriculture.—Sheep and Cattle Feeding Experiments 1904-5. (47 pp.) 1905.

India—

Imperial Bacteriologist. Report for 1904-5. (29 pp.)

Assam.—Department of Agriculture. Report for 1904-5. (23 pp.)

Italy—

Ministero di Agricultura.—Costruzione di Ricoveri per Bovini in Sardegna. (82 pp.) 1905.

Spain—

Dirección General de Agricultura.—Prados y Pastos. (355 pp.) 1905.

Sweden—

Eriksson, J.—Den Amerikanska Krusbärsmjöldaggen pä Svensk Mark. (16 pp.) 1905.

Landtbrukets främjande genom Statsförvaltningen, 1900-4. (1,068 pp.) 1905.

United States—

Bureau of Biological Survey.—Bull. 21. The Bobwhite and other Quails of the United States in their Economic Relations. (66 pp.) 1905.

Bureau of Chemistry:—

Circ. 10 (revised). Methods of Analysis of Insecticides and Fungicides. (11 pp.) 1905.

Bull. 96. Influence of Environment on the Composition of Sugar Beet. 1904. (66 pp.)

Bureau of Entomology.—Circ. 64. The Cottony Maple Scale. (6 pp.) 1905.

Office of Experiment Stations.—Bull. 156. Studies on the Digestibility and Nutritive Value of Bread and of Macaroni at the University of Minnesota. 1903-5. (80 pp.)

Farmers' Bulletin:—

No. 228. Forest Planting and Farm Management. (22 pp.) 1905.

No. 230. Game Laws for 1905. (54 pp.)

Forest Service.—Bull. 67. Forest Reserves in Idaho. (90 pp.) 1905.

Bureau of Plant Industry.—Bull. 90, Part I. Storage and Germination of Wild Rice Seed. (13 pp. + 2 plates.) 1905.

New Jersey Agricultural Experiment Station:—

Bull. 186. Late Fall Spraying for the San José or Pernicious Scale. (14 pp.) 1905.

Bull. 187. Analyses and Valuations of Commercial Fertilisers. (21 pp.) 1905.

Wisconsin Agricultural Experiment Station:—

Bull. 127. Principles and Practice of Horse-Breeding. (128 pp.) 1905.

Bull. 128. Swiss Cheese Trouble caused by a Gas-Forming Yeast. (26 pp.) 1905.

Bull. 129. Some Creamery Problems. (26 pp.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

Average Prices of Live Stock in England and Scotland in the Month of October, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
Fat Stock :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 9	7 3	36 10	33 9
Herefords	7 7	7 0	—	—
Shorthorns	7 5	6 11	36 0	32 11
Devons	7 8	6 11	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7½	6¾	8¼	6¾
Sheep :—				
Downs	8½	8	—	—
Longwools	8	7¼	—	—
Cheviots	8½	8¼	8½	7¾
Blackfaced	8	7¼	8¼	7½
Cross-breds	8½	7¾	8¾	7¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 9	6 4	6 8	5 9
Porkers	7 5	7 1	7 2	6 5
Lean Stock :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 2	17 15	21 9	15 12
,, —Calvers ...	20 12	17 7	17 8	15 0
Other breeds—In Milk ...	18 1	14 18	18 9	15 4
,, —Calvers ...	—	13 17	18 3	14 13
Calves for Rearing	2 2	1 14	2 4	1 7
Store Cattle :—				
Shorthorns—Yearlings ...	8 17	7 14	9 6	7 18
,, Two-year-olds	12 5	10 17	14 5	11 16
,, Three-year-olds	15 10	13 10	16 1	13 14
Polled Scots—Two-year-olds	—	—	14 14	12 9
Herefords— ,,	16 3	13 12	—	—
Devons— ,,	12 10	10 12	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	37 1	34 8	—	—
Scotch Cross-breds ...	—	—	27 8	22 8
Store Pigs :—				
Under 4 months	27 8	20 9	22 3	17 10

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	50 0	47 6	45 6	—	54 0*	53 6*
	2nd	48 6	43 0	41 0	—	53 6*	45 6*
Cow and Bull ...	1st	—	41 0	38 0	37 6	42 0	39 0
	2nd	—	35 6	33 0	31 0	35 0	32 6
U.S.A. and Canadian :—							
Birkenhead killed	1st	48 6	45 6	43 6	45 0	44 6	44 6
	2nd	43 6	39 6	38 6	38 6	39 6	40 6
Argentine Frozen—							
Hind Quarters ...	1st	30 0	29 0	30 6	29 6	31 0	31 6
Fore ,, ...	1st	24 0	25 0	23 6	23 6	26 0	25 6
Argentine Chilled—							
Hind Quarters ..	1st	36 6	37 0	35 0	34 6	—	38 0
Fore ,, ...	1st	27 0	26 6	25 6	24 6	—	28 6
American Chilled—							
Hind Quarters ...	1st	54 0	52 6	52 6	52 6	54 0	53 6
Fore ,, ...	1st	32 6	33 6	32 6	32 6	34 6	35 0
VEAL :—							
British	1st	71 0	57 6	62 0	70 0	—	—
	2nd	58 6	48 6	57 0	62 6	—	—
Foreign	1st	70 0	—	—	—	—	63 6
MUTTON :—							
Scotch	1st	70 0	67 6	68 0	70 0	72 6	68 6
	2nd	65 6	56 0	64 0	66 0	55 0	54 0
English	1st	67 0	69 0	65 6	61 0	—	—
	2nd	62 0	56 6	58 6	53 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	51 6	51 6	58 6	—	—
Argentine Frozen ...	1st	32 0	33 0	32 6	32 6	32 6	32 6
Australian ,, ...	1st	30 0	32 0	32 6	—	32 0	—
New Zealand ,, ...	1st	39 0	39 0	42 0	42 0	32 0	—
LAMB :—							
British	1st	70 0	65 6	—	—	70 0	—
	2nd	65 6	58 0	—	—	56 0	—
New Zealand ...	1st	45 6	49 0	45 0	44 6	46 6	—
Australian	1st	—	41 0	—	—	—	—
Argentine	1st	—	42 0	—	—	—	—
PORK :—							
British	1st	70 0	68 0	66 0	65 6	56 0	57 6
	2nd	60 6	61 0	61 0	60 6	53 6	49 0
Foreign	1st	66 0	66 6	65 6	65 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ...	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1	30 8	22 5	19 10	24 10	18 4	16 6	18 3
,, 20 ...	27 10	26 9	30 10	23 7	20 4	24 8	18 5	16 7	18 5
,, 27 ...	27 8	26 9	30 11	23 7	19 8	24 4	18 5	16 7	18 8
June 3 ...	27 6	26 10	31 3	23 10	18 8	23 6	18 4	16 8	19 1
,, 10 ...	27 8	26 6	31 4	21 5	18 5	24 0	18 7	16 10	18 11
,, 17 ...	27 6	26 5	31 7	20 7	18 2	26 0	18 3	16 8	19 1
,, 24 ...	27 6	26 5	31 7	22 0	19 2	23 9	18 6	16 10	18 10
July 1 ...	27 9	26 4	31 8	20 7	18 8	23 2	18 6	17 1	19 7
,, 8 ...	28 1	26 6	32 1	19 11	19 8	22 11	18 3	17 1	19 6
,, 15 ...	28 3	26 10	32 3	20 5	18 9	23 10	18 7	17 6	19 7
,, 22 ...	28 7	27 7	32 2	20 10	18 10	23 7	18 5	17 6	18 11
,, 29 ...	28 11	28 0	32 3	21 0	19 9	23 11	18 6	17 10	19 3
Aug. 5 ...	29 3	28 3	31 11	20 1	19 9	22 0	18 8	17 10	18 4
,, 12 ...	29 11	28 4	30 5	21 3	19 9	22 5	18 10	17 7	16 11
,, 19 ...	29 9	28 8	28 5	20 4	22 5	23 4	18 6	16 7	16 4
,, 26 ...	30 0	29 5	27 1	22 3	23 2	23 6	18 7	16 5	15 9
Sept. 2 ...	30 3	30 2	26 11	22 5	25 3	23 5	18 5	16 3	15 9
,, 9 ...	28 6	30 0	27 1	22 4	24 10	23 4	17 0	16 1	15 11
,, 16 ...	27 5	29 7	26 11	24 2	24 9	23 7	16 4	15 11	16 0
,, 23 ...	27 0	29 10	26 8	24 0	25 10	23 10	16 2	15 9	15 11
,, 30 ...	26 3	29 10	26 9	23 9	25 5	24 3	15 9	15 8	16 1
Oct. 7 ...	25 10	30 2	26 9	23 8	25 6	24 9	15 6	15 9	16 3
,, 14 ...	25 8	30 5	26 11	23 9	25 4	24 10	15 5	15 8	16 6
,, 21 ...	25 10	30 4	27 1	23 7	25 5	25 0	15 8	15 11	16 7
,, 28 ...	26 0	30 6	27 4	24 2	24 11	24 11	15 8	15 10	16 8
Nov. 4 ...	26 4	30 6	27 10	24 3	25 0	24 9	15 9	16 0	17 1
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels* computed from the Weekly Averages of Corn Returns from the Returning Markets of ENGLAND AND WALES, pursuant to the Corn Returns Act, 1882, together with the QUANTITIES returned as sold at such Markets, in the under-noted periods of the Years 1905, 1904, and 1903.

QUARTER ENDED	PRICES.			QUANTITIES.		
	1905.	1904.	1903.	1905.	1904.	1903.
Wheat.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	30 6	27 5	25 2	483,158	614,479	694,912
Midsummer ...	30 11	27 1	26 11	292,455	547,624	639,441
Michaelmas ...	29 5	28 5	28 8	626,360	360,182	307,834
Christmas ...	—	30 3	26 3	—	615,857	654,536
Barley.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	24 11	22 4	23 5	638,421	895,030	975,720
Midsummer ...	24 7	20 5	22 2	40,128	79,211	98,961
Michaelmas ...	23 4	21 7	21 6	273,138	180,629	28,938
Christmas ...	—	24 9	23 8	—	2,282,306	1,772,130
Oats.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	16 7	16 0	16 11	368,984	420,596	372,119
Midsummer ...	18 1	16 6	18 0	131,912	185,660	188,528
Michaelmas ...	17 5	16 10	18 0	202,514	237,239	120,931
Christmas ...	—	15 11	15 8	—	473,021	368,417

* Section 8 of the Corn Returns Act, 1882, provides that where returns of purchases of British Corn are made to the local inspector of Corn Returns in any other measure than the imperial bushel or by weight or by a weighed measure, that officer shall convert such returns into the imperial bushel, and in the case of weight or weighed measure the conversion is to be made at the rate of 60 imperial pounds for every bushel of wheat, 50 imperial pounds for every bushel of barley, and 39 imperial pounds for every bushel of oats.

CORN PRICES:—HARVEST YEAR.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels computed from the Weekly Averages of Corn Returns, together with the QUANTITIES returned as sold at the Returning Markets during each of the Harvest Years ending 31st August, 1895 to 1905.

HARVEST YEARS.	PRICES.			QUANTITIES.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
1894–95 ...	21 5	21 5	14 8	2,180,959	3,136,415	693,121
1895–96 ...	24 10	22 4	14 1	1,640,943	3,366,364	672,547
1896–97 ...	28 8	23 2	16 9	2,597,268	3,200,612	551,912
1897–98 ...	36 2	26 11	18 3	2,534,224	3,339,842	599,666
1898–99 ...	26 0	26 1	17 3	3,498,515	3,629,760	777,676
1899–00 ...	26 4	25 2	17 4	3,255,654	3,355,241	722,859
1900–01 ...	27 1	25 0	18 1	2,463,341	3,109,149	684,956
1901–02 ...	28 4	25 11	20 4	2,451,275	3,176,599	698,840
1902–03 ...	26 5	23 4	17 8	2,386,017	3,151,337	1,104,660
1903–04 ...	27 2	21 10	16 4	2,129,448	2,780,473	1,132,086
1904–05 ...	30 7	24 6	17 0	1,746,927	3,141,058	1,178,154

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d	s. d.	s. d.	s. d.
France:	September...	37 5	38 0	22 7	24 0	17 4	20 0
	October ...	38 0	38 7	23 0	23 10	17 6	20 2
Paris:	September...	38 7	39 5	23 7	24 2	19 0	20 2
	October ...	40 4	39 6	23 3	24 2	18 11	20 9
Belgium:	August ...	30 0	30 10	21 6	22 4	19 4	20 4
	September...	30 11	29 8	22 4	22 8	18 7	18 11
Berlin:	August ...	39 0	37 0	—	—	20 8	19 4
	September...	38 11	37 1	—	—	19 11	19 9
Breslau:	August ...	38 0	36 5	24 7	23 9	18 9	18 10
	September...	37 1	35 1	25 9	25 0	19 2	19 2

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of October, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	30 1	28 2	26 2	25 6	16 7	17 10
Norwich	30 4	27 1	25 7	24 4	15 2	15 11
Peterborough ...	30 3	26 4	24 2	24 5	15 4	16 2
Lincoln	30 1	26 3	25 0	24 11	14 11	16 2
Doncaster	29 0	26 5	23 1	23 7	15 3	16 0
Salisbury	29 7	27 4	25 9	24 9	16 6	17 0

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	15 0	13 6	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	116 0	114 0	117 0	112 6	114 6	111 6	114 6	—
Danish ...	123 6	121 6	126 0	123 6	124 6	122 6	124 0	—
Russian ...	107 6	103 6	118 6	114 6	—	—	105 6	—
Australian ...	112 0	109 0	—	—	—	—	—	—
Argentine ...	112 6	110 6	—	—	—	—	—	—
CHEESE :—								
British, Cheddar	74 0	68 0	—	—	70 0	65 0	62 6	58 0
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	67 6	60 0	65 6	60 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	57 6	56 6	59 0	57 0	57 0	54 6	58 0	55 6
BACON :—								
Irish	63 6	60 6	65 6	63 6	63 6	61 0	64 0	61 0
Canadian ...	60 0	58 0	56 6	54 0	59 0	57 0	60 6	56 0
HAMS :—								
Cumberland ...	101 0	98 0	—	—	—	—	—	—
Irish	100 0	94 0	—	—	—	—	102 0	92 0
American (long cut) ...	52 0	48 6	51 6	47 0	51 6	48 0	54 6	50 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	15 0	13 4	—	—	—	—	—	—
Irish	14 6	11 6	11 2	9 11	10 7	10 0	10 3	9 10
Danish ...	12 4	10 1	11 8	9 4	11 2	10 7	10 6	9 11
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen...	65 0	56 0	—	—	41 6	36 6	48 6	40 0
Scottish Triumph...	70 0	57 6	45 0	40 6	43 6	38 6	45 0	40 0
Up-to-Date ...	68 6	56 0	45 0	36 6	41 6	36 6	45 0	40 0
HAY :—								
Clover... ...	89 0	79 6	81 0	73 6	83 6	65 0	71 0	64 6
Meadow ...	75 6	65 0	71 6	62 6	—	—	68 6	63 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	37	41	680	1,079
Swine Slaughtered as diseased or exposed to infection ...	136	175	3,044	5,028
Anthrax :—				
Outbreaks	67	90	810	832
Animals attacked	85	114	1,139	1,280
Glanders (including Farcy) :—				
Outbreaks	85	107	1,026	1,303
Animals attacked	139	164	1,765	2,284
Sheep-Scab :—				
Outbreaks	37	26	713	1,115

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	1	5	46	180
Swine Slaughtered as diseased or exposed to infection ...	41	273	1,404	3,980
Anthrax :—				
Outbreaks	—	—	3	3
Animals attacked	—	—	3	3
Glanders (including Farcy) :—				
Outbreaks	8	1	25	10
Animals attacked	37	1	92	31
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	11	10	249	388

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XII. No. 9.

DECEMBER, 1905. [NEW SERIES.]

THE BRITISH CROPS OF 1905.

The preliminary estimate of the yield of the cereal, root, and hay crops, issued on the 24th November last, are given in the following table, which shows also the extent to which each crop differed from the average of the preceding ten years :—

Crop.	Yield per Acre in 1905.	Difference from Average of 1895–1904.	Crop.	Yield per Acre in 1905.	Difference from Average of 1895–1904.
	Bushels.	Bushels.		Tons.	Tons.
			Potatoes ...	6·18	+0·35
Wheat ...	32·78	+2·22	Turnips and Swedes ...	13·74	+0·86
Barley ...	33·91	+1·09	Mangold ...	20·32	+2·00
Oats	38·16	−0·65		Cwts.	Cwts.
Beans... ...	32·28	+4·62	Hay from Clover, &c.	28·72	−0·17
Peas	25·71	−0·59	Hay from Permanent Grass	21·71	−1·52
			Hops	14·21	+5·57

From this it will be seen that seven of the eleven items separately collected were above the average—wheat, beans, mangolds, and hops by a considerable amount—while in none of the other four crops was the deficiency a very large one, so that the harvest of 1905 may be described as distinctly satisfactory upon the whole, particularly in Scotland, where the hay crop alone was slightly below the mean.

The actual quantities of cereals harvested in 1905 and 1904 are shown in the next table. Comment has already been made in an earlier number of this *Journal* (September, p. 335), upon the largely increased area sown to wheat this season, and with an increase of almost 6 bushels per acre as compared with last

year, the total production is over 22,000,000 bushels, or almost 60 per cent. greater than in 1904. It may be noted that this is the largest total since 1899. The yield proved to be greatest in Scotland, where it amounted to 42·46 bushels, or $4\frac{3}{4}$ bushels above the average; this is within one-hundredth of a bushel of the highest previously returned (42·47 bushels in 1898). The yield in England was 32·66 bushels per acre, but this has been exceeded four times in the past decade; while the Welsh yield was only $1\frac{1}{2}$ bushels above the average.

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1895–1904.
	1905.	1904.	1905.	1904.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
Wheat	58,902,499	36,880,246	32·78	26·82	30·56
Barley	58,110,064	57,193,067	33·91	31·07	32·82
Oats	116,436,887	127,407,848	38·16	39·17	38·81
Beans	8,201,730	5,827,789	32·28	23·12	27·66
Peas	4,439,483	4,441,103	25·71	25·75	26·30

Barley, in spite of a smaller area, yielded nearly 1,000,000 bushels more than in 1904, nearly all of this increase being noted in Scotland, as an increase of 260,000 bushels in England was partly counterbalanced by a decrease in Wales. The Scotch yield, 37·73 bushels per acre, is the second highest average recorded, being about $1\frac{1}{3}$ bushels below that of 1898.

Oats were less satisfactory, being 1·3 bushels below the average in England; an over-average yield in Scotland and Wales, however, reduces the deficiency for Great Britain as a whole to about two-thirds of a bushel.

Beans proved one of the best crops of the year; not since 1891 have over 1,000,000 quarters been harvested in Great Britain. The acreage was, however, much larger in the eighties, and the only occasion when the present yield was exceeded was in 1890, in which year 32·65 bushels per acre were returned. The English yield was $4\frac{3}{4}$ bushels above the average, and the Scotch return of 36·76 bushels, although grown in a comparatively small area, is, it may be noted, no less than $1\frac{1}{2}$ bushels above the highest hitherto recorded. Peas proved to be six-tenths of a bushel below the average, the decline being only

noted in England, and Scotland obtaining over 1½ bushels above the average.

Particulars of the root and hay crops are given in the next table. Potatoes have yielded rather less than last year, but still an over-average crop has been secured. Scotland is again the most favoured of the three divisions of Great Britain, its 6·79 tons per acre being not far short of a ton above the mean and only a third of a ton below last year's record yield; the Welsh and English crops were about 4 cwt. above the average.

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1895–1904.
	1905.	1904.	1905.	1904.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Potatoes	3,762,706	3,588,254	6·18	6·29	5·83
Turnips and Swedes ...	21,840,582	23,036,129	13·74	14·36	12·88
Mangold... ...	8,213,260	7,481,402	20·32	18·76	18·32
			Cwts.	Cwts.	Cwts.
Hay from Clover &c.	3,143,352	3,497,063	28·72	30·11	28·89
Hay from Permanent Grass...	5,087,971	5,875,696	21·71	24·66	23·23
	Cwts.	Cwts.			
Hops	695,943	282,330	14·21	5·91	8·64

The yield of turnips and swedes was good, though not up to last year; both England and Scotland had almost a ton above the average, but Wales, with a deficiency of 2 tons below the mean, was unfortunate. Mangold did much better than the other big root crop, and exactly 2 tons more than the average were obtained throughout Great Britain as a whole. The present year's yield per acre has only been surpassed three times, and the total production only twice, in the preceding twenty years. The English yield was relatively rather better than the Scotch, while the Welsh was less than half a ton over the average.

The hay crop was, perhaps, the least satisfactory of the year, both categories being below the average, although that from clover and rotation grasses was only very slightly so. Hay from permanent grass was 1½ cwt. below the average, Scotland doing better than England in this case, while in rotation grasses England was a little the better. In no case, however, was the

yield actually up to the average. Wales, on the other hand, had an over-average yield in both classes of hay.

The yield of hops proved to be the largest on record, surpassing by almost $1\frac{1}{2}$ cwt. per acre the previous best recorded, in 1899; it was no less than 65 per cent. above the preceding ten years' average, and 140 per cent. above the abnormally low yield of 1904. The total production, moreover, has only once been surpassed, viz., in 1886, when, however, there were as much as 70,000 acres under hops. The details regarding the produce of hops in the different counties were given in an earlier number of this *Journal* (October, p. 419).

THE ERADICATION OF SHEEP SCAB IN SCOTLAND.

During the present year great interest has been aroused in the question of the eradication of sheep scab, and it has been considered desirable to place on record a short account of the methods adopted by the Board to deal with the disease in the Highlands and islands of Scotland.

On the 30th January, 1905, the policy which the Board proposed to adopt was indicated in a circular letter* ($A\frac{121}{C}$) sent to all the local authorities in Great Britain. This communication, after briefly explaining the reasons for the Board's action, and stating that they had determined to take energetic measures with a view to the speedy eradication of sheep scab, drew attention to three Orders which had just been issued.

The first of these (the Sheep Scab Order of 1905, No. 6879), does not differ in principle from the previous Sheep Scab Order which it revoked, but contains certain modifications, chiefly in the direction of placing increased powers in the hands of inspectors. The second Order [the Sheep Scab (Compulsory Dipping Areas) Order of 1905, No. 6880] was framed with a view to the adoption of special precautions in localities where sheep scab is known or suspected to be prevalent, and aims at regulating the movement of sheep out of areas to which its provisions may be applied by subsequent order of the Board, and at securing that at suitable periods all sheep within such areas shall be effectually dipped, irrespective of the presence or otherwise of disease on

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* *Journal*, Feb., 1905, p. 658.

any particular holding. The third Order [the Sheep Scab (Regulation of Movement) Order of 1905, No. 6881], provides for the general regulation of the movement of sheep out of any district to which its provisions may be applied by subsequent order of the Board, and the intention was to apply its provisions to those groups of counties or parts thereof in which sheep scab has long been known to be prevalent, or to which experience has shown that precautionary measures are necessary in the interests of other districts. It was indicated in paragraph 16 of the circular letter of explanation that this Order would be applied, *inter alia*, to regulate the movement of sheep from Scotland to England.

In pursuance of this policy, a large area, comprising about two-thirds of Scotland, was scheduled under the Movement Order as an area out of which sheep could not be moved without a licence requiring them to be detained and isolated on the premises to which they were to be sent for a period of fifty-six days, or until they had been effectually dipped in the presence and to the satisfaction of an inspector of the local authority in whose district the premises were situated. In certain districts within this area it was proposed to require the compulsory dipping of all sheep, while the actual cases of disease were to be dealt with in accordance with the provisions of the Sheep Scab Order.

It is worthy of remark that the first announcement of the proposals as to the movement of sheep called forth no protest at the time from any local authority, and no serious opposition was offered till the issue on 28th of March of the above-mentioned Order defining the area affected. The near approach of the time when the Order would be enforced roused a feeling of widespread alarm among salesmen, flock-masters, and others, who feared that the restrictions on movement from the scheduled area would prejudicially affect the trade with England, and result in a depreciation of North-country stock. A number of meetings were held, representations were made to the Board, and eventually the operation of the Order was suspended in order that a deputation might lay the case of the flockmasters before the President of the Board of Agriculture. The delegates came to the offices of the Board on the 20th May, and after pointing out the detrimental

effects upon the trade in sheep which would, in their opinion, follow from the enforcement of the Movement Order, assured the President that he could rely upon the energetic co-operation of the local authorities concerned if the compulsory dipping of all sheep within the scheduled area were enforced as an alternative to the movement regulations.

Mr. Fellowes, in reply, informed the deputation that the Board had but one object in view, namely, the speedy eradication of sheep scab in the interests of the flockmasters themselves. The Board were, however, bound to take into account the interests of flockmasters throughout the country generally, and after a careful review of all the circumstances, he could not, on the information before him, assent to the unrestricted movement of sheep out of the scheduled area in the present circumstances. He was advised that there were considerable difficulties, both administrative and financial, in the way of formulating any comprehensive scheme for the compulsory and efficient dipping of all sheep within the area under conditions such as would justify him in withdrawing the restrictions, but if the various local authorities would devise such a scheme and were unanimous in their desire to carry it out, the position would be materially altered.

An alternative scheme was accordingly drafted, of which universal dipping was the chief characteristic. But as it was considered essential that no undipped sheep should be moved out of the area, provision was made for the following requirements. The dipping was to begin at a time before the general exodus of sheep to the South took place, notice was in every case to be sent to the local authority in order that an inspector might be able to attend and satisfy himself that it was efficiently carried out, and care was to be taken to keep the undipped sheep apart from the dipped. At the conclusion of the period (15th July to 1st September) returns of all sheep dipped were to be forwarded by the occupiers to the local authority on a prescribed form.

The scheme, which was prepared by the representatives of the local authorities, in conjunction with the officials of the Board, was finally accepted and embodied in the Sheep Dipping (Scotland) Order of 1905, No. 6926).

The area within which this Order was enforced covered about

two-thirds of Scotland. It had a sheep population of more than three and a-half millions, and included some very wild and difficult country, such as islands, mountains, moor, and forest, where the obstacles to the success of a general dipping order would be strongest.

The very cordial support, however, given to the Order by the local authorities and the chief flockmasters of the district affected, enabled the regulations to be carried out successfully in nearly every case within the time appointed.

The principal objects to be secured, if the desired results were to be achieved, were as follows : The dipping of all the sheep within as short a period as was compatible with the circumstances, the separation of the dipped from the undipped sheep, and the enforcement of restriction on movement out of the area. In order to secure the last object it was necessary that the Order should be brought into force before the general movement began. In the part of Scotland affected the movement begins about the middle of July, or a little earlier, and continues till the end of September, a few animals remaining even till October. A period of from two to three months was, however, considered too long for the purposes of the dipping regulations, and after some discussion and debate it was arranged that all the dipping was to take place between the 15th July and 31st August. In order to prevent any evasion of the regulations it was decided that the dipping was to be carried out under the supervision of the local authorities, and in one of the dips approved by the Board. All owners of sheep were required to give adequate notice to the local authorities of the date when they proposed to dip, in order that proper supervision might be provided for, and they were to produce, if necessary, satisfactory evidence that the prescribed dipping had been thoroughly and efficiently carried out. For this purpose proper forms were printed and circulated.

By the date fixed all the local authorities, except in the county of Elgin, had made satisfactory preparations and appointed inspectors. Here there was a failure to appoint any inspectors during the first fortnight of the operation of the Order, and it would probably have been impossible for the Board to accept the dipping during this time as satisfactory had

not one of their inspectors fortunately been able personally to attend all dippings in the county till the local authority had appointed their own inspectors. The methods of carrying out the supervision varied very considerably. In twelve out of the eighteen counties the police were employed under the orders of the chief constables. The notices of proposed dippings were sent to the local police officer, and he attended in as many instances as was possible. In Argyllshire, in addition to the police, some sixty emergency inspectors were provided, who could be called upon for assistance when required. In Sutherland, where a police officer's beat often covers an enormous tract of country, the Duke of Sutherland's ground officers were appointed to assist. In Aberdeenshire four retired police officers were engaged as assistants. In Perthshire thirteen, and in Elginshire seven special inspectors were appointed to assist the police. In Orkney and Shetland, where there are few police, a number of special officers were appointed. In Fife, Kinross, and Dumbartonshire the veterinary inspectors of the local authority were employed. In all cases where additional assistance was required it was paid for, though not in the same way in every instance. In one county, for instance, the officer was paid by the week, in another by the number of days employed.

In addition to these officers the Board's inspectors in Scotland, consisting of four veterinary and seven lay inspectors, gave almost the whole of their time to visiting and watching the work in the dipping area. The veterinary inspectors were specially detailed to watch the dippings in the Western Highlands and islands, where sheep scab is difficult to eradicate owing to the climate. These officers found evidence that very careful attention had been paid to the sheep, and reported favourably on their general condition. They discovered no case of sheep scab, and, indeed, only two cases were reported during the dipping period, thus confirming the experience of past years.*

The work of inspection and supervision was carried out energetically in all cases, and by the willing co-operation of the

* The statistical returns of outbreaks of the disease show that it is usually at its lowest ebb in the quarter ending the 30th September. During this quarter the outbreaks of scab in the scheduled counties have been as follows:—1902, six; 1903, four; 1904, two.

flockmasters the general dipping was completed by the end of August. In certain districts, however, considerable opposition was shown by the Crofters, especially in Inverness-shire, Ross, and Sutherland, where objections were raised to carrying out the Order at all. There is much to be said from their point of view. They had not been represented at the meetings ; they knew little or nothing of the circumstances leading up to the Order ; the time was very inconvenient ; they had no dippers, and in some parts had never been accustomed to dip, only to smear the sheep. It is greatly to the credit of all concerned that these objections were so generally overcome. The police were active in explaining the reasons for and the requirements of the Order, and the landowners and large farmers placed their dippers at the service of their Crofter neighbours, and in some places even supplied the dip and gathered the sheep. The only places where sheep remained undipped at the end of August were parts of Shetland and the Isle of Lewis, where the Crofters were away fishing and the sheep could not be gathered. In these cases the period was, at the desire of the local authorities concerned, extended by a further Order of the Board. All the local authorities have since reported the number of sheep dipped, and have expressed their satisfaction with the execution of the Order. Their returns of sheep dipped, when compared with the estimated sheep population, are, on the whole, very satisfactory.

There are, finally, two points to be considered in estimating the success of the work : the expense of supervision and the efficacy of the dipping. The cost to the local authorities varied very greatly. In Perthshire, where the sheep population is about 660,000, it reached £1,000, and in Fife, where there are 105,000 sheep, it reached £200. In Argyllshire, on the other hand, the cost was £155 for 840,000 sheep, and in Aberdeenshire, where almost every dipping was attended by a police officer, the cost was £80 for 200,000 sheep. These figures include the expenses of printing and advertising.

The efficacy of the dipping depends on the thoroughness with which it was done. There is no doubt that in every case it was carried out to the utmost ability of the owner. But the practical difficulties were often very great. Care had to be

exercised to secure a complete gathering in the hill districts, to keep the sheep long enough in the bath when a large number had to be dipped in a given time, and to secure the isolation of the dipped from the undipped sheep. The labour and expense entailed in the dipping of a large hill stock may be realised by a reference to the experience of the late Donald Cameron of Lochiel. This owner had in his hands over 30,000 sheep, of which 15,000, divided into thirteen hirsels, had to be brought to one place to be dipped. Some of the sheep had to be driven over very wild country nine miles to the dipper, and during the work, which lasted a fortnight, the shepherds were fully employed from daybreak to dark.

The experience gained during the summer of 1905 proves that with the co-operation of the local authorities and the flock-masters a general dipping of sheep within a fixed period of some six weeks is quite possible, even under such difficult conditions as obtain in the Highlands of Scotland. It now remains to be seen whether the method employed will be successful in eradicating sheep scab and justify the renewed unrestricted movement of sheep to the South.

THE NATIONAL FRUIT AND CIDER INSTITUTE AND ITS WORK.

An account of the experimental work on cider and perry conducted at the National Fruit and Cider Institute, Long Ashton, Bristol, was given in the September number of this *Journal* (p. 321). It is now proposed to supplement this with an account of the experimental work which is being carried on in the fruit-growing department of the Institute.

Among the objects in view in the establishment of this branch may be mentioned the cultivation of market fruits of all kinds; investigations as to their value; instruction in cultivation, packing, and marketing; bottling, and other systems of preserving fruit; the demonstration of the use and effect of various insecticides and washes for preventing and eradicating insect and fungoid pests, and such parasites as moss and lichen; and the testing of various natural and artificial manures.

At present the department is in three divisions, which, taken in their order of formation, are :—(1) the Orchards ; (2) the Nursery; and (3) the Plantation.

The Orchards.—The orchards comprise rather more than two-thirds of the land rented, which is about fourteen acres. One is an old orchard, taken from the former tenant, and contains a typical collection of trees of different ages and sizes, in various stages of healthfulness or otherwise, some producing apples good for eating or cooking, others bearing fairly good fruit for cider-making, while other trees are good for nothing but fire-wood, being either decrepit or bearing apples which are useless for any of the above purposes. Many of the whole collection are unknown as regards names, being just local varieties and seedlings. The quite useless trees will be removed and replaced, but the others, being useful for the demonstration of pruning, spraying, &c., will be retained.

An experiment is being tried in this old orchard with liquid farmyard manure (of which there is abundance), to see how it will improve not only the trees but the grass and herbage underneath them. Farmers as a rule, even if they know the value of this manure, do not preserve it as they might do, considering that it is one of the very best and cheapest forms of fertiliser obtainable.

In the new orchard about 200 trees were planted in the season of 1903-4. They are nearly all apples, but about two dozen pears have been included. All of them, as well as every other tree planted on the Institute land, have been planted with a view to experimenting on them in various ways. In the first place two very different kinds of trees, called " Herefords " and " Somersets " respectively, to distinguish the two systems, were used in alternate rows.

The " Hereford" System.—Those termed " Herefords " are the best of the varieties grown in Hereford, but budded close to the ground on the seedling apple or crab stock to form a stem and head with such variety as they have to bear permanently. This system is in vogue not only in Hereford, but in all other counties where there are nurseries. It is, generally speaking, the best method, and has the advantage over what we have called the " Somerset " method, as the trees come more quickly

into bearing and profit. Its disadvantage lies in the fact that some varieties of cider fruit are poor growers, more so, perhaps, than market varieties, if budded or grafted close to the ground. For example, one of the very best apples used in nearly all blends by the Somerset cider-makers—the Horner, or Hang-down—is such a bad grower that it is next to impossible to make it form a straight stem. But, when worked on the "Somerset" system it will do fairly well.

The "Somerset" System.—This system has been called the "Somerset," because it is more practised in that county than any other. It has its advantages and disadvantages. One advantage is that a strong growing variety, such as the Morgan Sweet or the Broad-leaf, both very strong and rapid growers, can be budded or grafted on the seedling apple or the crab stock. It then grows well, forms a stem in two years, and is cut back at 6 ft. high to make a shapely head, which it should do in another two years. At this age, four years from bud or graft, the trees are at their best for planting out in the orchard. If care is taken in the planting and after treatment, they should be ready for head grafting in the spring but one after planting. This means that a tree planted in November, 1905, should be ready to graft in April or May, 1907, or 1908. In this way a tree with a clean, straight stem is obtained, a very essential point in grass orchards where cattle are allowed to run. All cider apples do well when head or branch grafted on the above-named varieties. The chief disadvantage in the method is the greater length of time it takes before the tree comes into profit. This does not matter so much if four-year-old trees are planted, but many persons, particularly in Somerset, prefer older ones, generally about eight years from the graft or bud, because they thus obtain a big tree capable at once of resisting cattle, overlooking the fact that these old trees cannot be transplanted so satisfactorily as the younger ones, because a lot of their fibrous roots are cut away in the lifting. The older trees, however, will undoubtedly do well if they have special attention in planting and in mulching and, possibly, watering, in the following summer. The system, therefore, with the exception mentioned, viz., when a weak grower is grafted on a strong one, is not to be recommended, and is gradually dying out, chiefly because it is

more expensive and requires a longer time to make a tree. For example, if one of these strong trees six or eight years old is planted, it will be one, two, or perhaps three or four years before it can be grafted in the head. Then it will be from two to five or six years before the tree bears fruit. In Somerset the original tree would cost four to five shillings. Head grafting would come to eightpence per tree, and the age of the tree before it bears (from original graft or bud), would be eight to fourteen years. With the other system, which has been called the "Hereford," a tree will bear at from four to six years old, the cost being from two shillings to three and sixpence per tree.

THE NEW ORCHARD.

In the new orchard the trees were planted at nine yards apart, diagonally. Ten or twelve yards would have been better in such good soil, but it was desired to plant as many varieties as possible. The system of planting diagonally or on the square has frequently been explained. By the former method 15 per cent. more trees per acre can be planted, and still be the same distance apart as on the square, because, although each tree in the orchard is 27 ft. from another, the distance from row to row is only $23\frac{1}{2}$ ft. All the holes or stations for trees were pegged out at once. The first row was got in line by means of sighting sticks and measured off exactly. The other rows were easily taken from this by using a piece of string 27 ft. long as a pair of compasses would be used in geometrical drawing. A fairly

stout peg was driven in for each station, and when the men were digging them they used a piece of string 3 ft. long with a loop at each end, and with a pointed stick scratched a circle 6 ft. in diameter. The turf was taken off and laid on one side, a good spit of soil dug out and laid on the other side, and the subsoil dug over, broken up, and trodden down again. This gives a certain amount of drainage under the tree, while treading firmly prevents the tree sinking.

Special attention was given to planting the trees. A little of the turf was returned to the bottom of the hole, and with some fine soil formed a slight mound for the roots of the tree to rest on. The tree, after having the roots carefully pruned to cut away their bruised ends, was just placed on the mound, which would be raised or lowered to get the right depth. In planting, the roots were spread out carefully in layers and some fine soil worked in round them, all being made thoroughly firm. After the roots were nicely covered the turf was returned to the hole grass side down, and within easy reach of the future roots, so that they might have good soil to ramble in. The surface of the holes has been kept hoed to keep down weeds for two years. In the early summer of 1904, before there was a possibility of the soil drying, a mulching of manure was given, with the result that all the trees grew very well, as, indeed, they could hardly help doing in such good soil.

The names of varieties planted in this orchard up to the present are given below :—

NAMES OF VARIETIES OF APPLES AND PEARS IN THE NEW ORCHARD.

Apples, Herefords.—The Foxwhelp, Strawberry Norman, Cowarne Red, Cherry Norman, Broad-leaf Norman, Knotted Kernel, Skyrmes Kernel, Eggleton Styre, Kingston Black, Chisel Jersey, and Medaille d'Or, The last named is a French variety, and has an excellent repute in that country. The Kingston Black was raised originally in Somerset, but the trees came from Hereford to Ashton.

Pears, Herefords.—Moorcroft, Taynton Squash, and Oldfield.

Apples, Somersets.—Morgan's Sweet, Broad-leaf (a very different one to the Broad-leaf Norman), King of the Pippins,

Hardwickes, Warner's King, Bramley's Seedlings, Ecklinville Seedling, Blenheim Orange, Annie Elizabeth, Newton Wonder, Peasgood's Nonsuch, Hollow Core, Sweet Alfrod, and Court Royal.

It will be easily understood that all of these were not raised in Somerset, but have been planted to head graft. They are given in their order of planting. The true Somerset-raised varieties are Morgan's Sweet, Broad-leaf, Hardwickes, and Court Royal.

They are planted, or will be grafted, in tens or fives of each. All the best of those grown in Hereford, Worcester, or Glou-

THE NEW ORCHARD.

cester were planted. For those on the "Somerset" system a variety of stocks for head-grafting were used, such as, to give only a few, Bramley's Seedling, Warner's King, and Ecklinville Seedling of the culinary varieties; King of the Pippins and Blenheims of the dessert kinds; and Morgan's and Broad-leaves of the strong growing but poor quality varieties. One row of eighteen varieties has been planted for head-grafting with one variety only, to test eventually by analysis if the stock has any effect on the juice or cider. This is an experiment which has not yet been tried and should be very useful.

Various experiments are to be carried out with these young trees, viz., (*a*) the soil in part of the stations will be sown next season with grass to see its effect on the future growth of

the trees; (*b*) some will be given another foot radius by digging a strip round; and (*c*) as the trees have grown so strongly, root-pruning will be tried on part of both (*a*) and (*b*) trees. Also, on the Hereford varieties, in the spring after planting, the heads were cut back by hard, medium, and light pruning respectively, the effects of which will be noted in the future growth and formation of fruit spurs.

Several methods of fencing were adopted to demonstrate their usefulness and to be able to state the cost of them to enquirers. One, two, and three uprights were used, with wire netting and barbed wire for the first; cross pieces and wire for the second; and vertical strips for the third method respectively. Where one stake only was used it was driven in first and the tree planted to it.

This young orchard is in the most prominent position, as it is in full view of everyone passing along the main road from Bristol to Weston, Clevedon, &c.

The Nursery.—Part of another old pasture field was used for this. A plot of about an acre was double dug or bastard trenched, keeping the turf near the surface or just turned upside down. The soil, as well as that in the orchards and plantation, is a rich, red, sandy loam on the new red sandstone formation. There is from 3 ft. to 5 ft. of loam lying on red marl, which runs down to brick clay. It is excellent soil for fruit-growing, but not the best for cider-making, as it is not heavy enough for the latter. In the early spring of 1904, 13,000 stocks were planted in the nursery, made up of 5,000 seedling crab, 5,000 seedling apple or free stock, 1,000 English Paradise, and 2,000 seedling pear. When they were planted, thirty loads of good dung were used, spread *over* the roots after they had been covered with a few inches of soil. Surface rooting is encouraged in this way. All the stocks grew extremely well, and as many as buds could be obtained for were budded in the following autumn. The same varieties of apples were budded on the crab and free stocks to test one with the other. Fives or tens were also worked on the Paradise, to produce fruit-bearing trees quickly, to determine the truthfulness to name or otherwise of the apple, and to provide fruit for exhibition purposes and grafts for distribution and use at home. The buds of all those varieties

of both pears and apples of which good wood could be obtained "took" very well. Almost all the apples and pears propagated are for cider and perry-making, a few others being grown as intermediate stocks. Those stocks where the buds missed were grafted last spring. It is very difficult indeed to get good wood for either grafts or buds, as in many instances it has to be cut from old orchard trees—no other being available—so "misses" were more frequent than in a nursery where suitable

ROW OF MOORCROFT PEARS (budded in 1904).

wood could be obtained. Nearly all of the stocks which were not worked in the autumn of 1904 and spring of 1905 were budded this last autumn. That some buds have grown well may be seen from an illustration of a row of Moorcroft pears from a photograph taken in September. It has been very noticeable that shoots from buds grow much more strongly than those from grafts.

All of the best vintage varieties of apples and pears have been propagated. Others, not so well known, are being grown in smaller quantities for trial. Although all the cider counties have sent buds or grafts, there will be room for others which

may be only known as "locals." From the nursery there will be ready in a few years a fine assortment of trees for distribution, first to the counties contributing to the Institute, so that they may form model, demonstration, or experimental orchards; afterwards to members or associates. The majority of the varieties grown here cannot be obtained from the trade. Grafts will also be available for what may be termed inter-county distribution.

A strip of the nursery is being used for propagating stocks by layering, to get a number of more regular growth than can possibly be got from seedlings.

In the cottage garden another batch of stocks is being raised from seeds of different apples, kept distinct from each other.

The Plantation.—This contains twelve varieties of dessert and culinary apples, six of each; three varieties of dessert and one of stewing pears; four varieties of black currants; three of red and one of white currants; five of raspberries; four of gooseberries, and eight of strawberries. The names are given below:—

NAMES OF VARIETIES OF FRUITS IN PLANTATION.

Dessert Apples.—Beauty of Bath, Devonshire Quarrenden, Worcester Pearmain, King of the Pippins, Cox's Orange Pippin, and Allington Pippin.

Cooking Apples.—Lord Suffield, Ecklinville Seedling, Stirling Castle, Lane's Prince Albert, Newton Wonder, and Bramley's Seedling.

Dessert Pears.—Williams' Bon Chrêtien, Louise Bonne of Jersey, Doyenne Boussoch.

Stewing Pear.—Catillac.

Black Currants.—Baldwin's, Carter's Champion, Lee's Prolific, and Black Naples.

Red Currants.—Fay's Prolific, Knight's Sweet Red, and Raby Castle.

White Currant.—White Dutch.

Raspberries.—Superlative, Northumberland Fillbasket, Norwich Wonder, Hornet, and The Guinea.

Strawberries.—Royal Sovereign, President, Noble, Latest of All, Sir Joseph Paxton, Waterloo, Monarch, Vicomtesse Hericart de Thury.

Gooseberries.—Whinham's Industry, Lancashire Lad, Crown Bob, and Keepsake.

Numbers of each "small fruit":—

80 each of the gooseberries and currants.
180 „ „ raspberries (of "The Guinea" only 50).
600 „ „ strawberries.

The size of the plantation is an acre, within a few square feet. It has been planted and will be worked as far as possible on commercial lines, while each variety of apple and pear will be experimented on with various methods of pruning (summer, winter, and root). Comparatively few varieties were selected,

THE PLANTATION.

as in growing for market it is not desirable to plant too great a variety, but rather fairly large quantities of each variety which will succeed and sell readily in the locality. Of the apples and pears thirty-three of each form a block, so that each block occupies exactly 1-16th of an acre. There are twenty-seven dwarfs or pyramids, three standards, and three single cordons of each. Careful records will be kept of the produce, so that it will be easy to calculate their value per acre. The plantation runs parallel with the nursery, with a driving way between. The soil was double-dug in the same way, but no manure was added, as it was thought the turf, when decayed, would be suffic ently rich to carry the trees, &c., for a

year or two, when manure could be used as a top-dressing. Potatoes were planted as a catch-crop to get the soil cleaned of weeds.

The standards were first placed in position at 30 ft. apart, diagonally. Stakes of pickled larch, 7 ft. 6 in. long by 4 in. by 2 in., were driven in and the trees planted to them. Afterwards it was comparatively easy to get the distances for the dwarfs or pyramids, which filled up the ground at 10 ft. apart; the gooseberries, &c., filling up to 5 ft. Then a row of strawberries was planted alternately with the other rows, or 5 ft. apart and 2 ft. in rows. The method of planting can be seen in the illustration on the preceding page.

All the apples and pears, as well as the bush fruits, were obtained from one nursery, to give them all the same opportunity from the commencement. The strawberries were obtained from specialists, and, as they could not be planted till the last spring, were not allowed to fruit this year. Of these fruits only a few varieties are being tested, but they are those best known and most generally grown in the district.

The growth of nearly all the trees, large and small, has been good this year. Some of the apples, such as Lane's, Suffields, and King of the Pippins, were allowed to carry a few fruit each. The cordons form a row at one side of the driving way, and, as they have grown strongly, every other one will be root-pruned this season to test the effect on the future growth and fruitfulness. The standards were four years, the dwarfs two years, and the cordons one year old from the bud or graft when planted.

Another half-acre is ready for planting this season. It will take a larger number of varieties of apples, only one row of each variety being used. More raspberries and gooseberries will also go in, as well as blackberries and logan berries.

To make the work of the department as educational as possible, the Managing Committee have arranged to take working pupils, who should come for at least one year, and who will have the opportunity of gaining a practical knowledge of orchard, nursery, and plantation work out of doors, and, if they wish, of cider-making indoors. Full particulars may be had from the Secretary, but those who wish to come must make up their minds to be "working" pupils.

JOHN ETTLE.

THE GUINEA FOWL.

The Guinea Fowl is more generally kept for ornament than as a utility fowl, and its merits for the latter purpose are apt to be lost sight of. It is, however, one of the most active foragers of all birds that can be kept on a farm, and the cost of keeping it, compared with other kinds of poultry, is small. The gross profits which it yields may not be as large as those from fowls, ducks, or turkeys, but the net profits are not unsatisfactory, as it is largely self-supporting.

It is particularly hardy, and generally sleeps in the trees about a farmyard rather than in a house. In this way it is free from restraint, and is able to spend the early hours of the morning in foraging for food. There is no better gleaner than the guinea fowl, and it will wander as much as a mile from home, but as it is chiefly insectivorous it does scarcely any damage to crops, and the benefits which it confers by ridding the fields of insect pests undoubtedly outweigh any slight injury caused in this way. It is well able to take care of itself, and there is little danger of its being killed by a fox, while its homing instinct is well developed, and it may be relied upon to come home to roost at night. The guinea fowl, therefore, requires little of the care and special management that must necessarily be given to other domestic poultry, as, if given free range, it will during the summer find almost all the food it requires.

Egg Laying.—Guinea fowls do not lay in the winter, but during spring, summer, and autumn they lay a number of eggs. Starting, as a general rule, in April, they lay without intermission daily for perhaps a month, and if the eggs are removed from the nest as they are laid the hens will continue for perhaps three months without becoming broody. If they remain in the nest and want to sit, it is only necessary to take away the nest-eggs and break up the nest, and within a week the hen will start to lay again in another place. Even the tamest birds seem to dislike laying indoors, and it is almost impossible to induce them to lay in hand-made nests. They prefer to make their own nests in secluded places, where they are well screened from view by bushes or weeds. So cleverly is the nest concealed that it is sometimes difficult to find, but when leaving the nest the hen utters a long and peculiar cry, which is not

heard at any other time, and by this means the whereabouts of the nest can be located.

It has been stated that the guinea cock is monogamous, but this is not strictly correct, though in order to secure fertile eggs it is best to keep equal numbers of cocks and hens. If there are many eggs in a nest at the time it is discovered they should be taken away a few at the time, for whilst the guinea hen may not be able to count, she can see the difference in the nest if, say, a dozen eggs are taken away at once and only one or two left as nest-eggs. But if the number is gradually reduced from a dozen or a score to one or two the difference is not detected, and the hen does not forsake the nest. The hen will desert the nest, however, if it is considerably disturbed, or if the surrounding weeds or bushes are trampled.

The eggs are about two-thirds the size of the ordinary hen's egg, but of excellent flavour. It is important, however, that they should be fresh, as contact with the earth or grass in a nest will after some days give them a most objectionable taste; it is therefore necessary to gather the eggs daily.

Hatching.—The eggs take from twenty-six to twenty-eight days to hatch, and as it is desirable to have the chicks hatched as early in the year as possible, it is advisable to set the eggs under ordinary hens. If the guinea hen hatches her first nest of eggs she will not lay again for the season, but she may be kept laying to September, or later, by preventing her from hatching. It is then too late to hatch guinea eggs, for late-hatched chicks will seldom live through the winter, and even if they should survive they remain small and of little use for marketing in February or March, which is the season for guinea fowls. A barn-door hen of average size can hatch about twenty eggs, and when the chicks are hatched their foster-mother cares for them in a more satisfactory manner than the guinea hen would, for the common hen is more tractable, and can be kept with her brood in a limited space.

Care of the Chicks.—The chicks leave the shell very soon after the appearance of the first chip, and almost immediately they are inclined to stray. In this way some may be lost unless a close nest-box is provided. For the same reason it is necessary to attach a closely-wired run to the coop, in which the

chicks are put after they are hatched. For rearing the chicks a combined coop and run has been found most convenient. This may be cheaply made of boards and wire netting about 5 ft. long, $2\frac{1}{2}$ ft. wide, and 2 ft. high. This should be divided into two parts, making a coop or sleeping compartment $2\frac{1}{2}$ ft. by 2 ft., and a run of $2\frac{1}{2}$ ft. by 3 ft. The sides of the run may be of $\frac{1}{2}$-in. wire netting, the sides of the coop being closely boarded. A slatted partition should divide the two sections, the whole being covered by a span roof of thin boards.

Feeding the Chicks.—The chicks may be left in the nest until they are about twenty-four hours old, and they can then be removed to the coop and fed for the first time. Owing to their liability to stray, the chicks must be kept within the confines of the coop and run until they become accustomed to the mother's call, but afterwards they may be given more liberty. When newly hatched the chicks may be fed on any patent chicken meal, moistened with milk and raw whipped eggs. They should also get green food from the start, and the best kind is chopped onions or leeks, but lettuce, dandelion, &c., may also be used to advantage. When the chicks are a few days old plainer foods may be freely used, and one of the most wholesome is coarse oatmeal fed dry. This may be varied by the occasional use of boiled rice, raw rice meal, hemp seed, millet seed, &c. At a later stage, say when three or four weeks old, some middlings and fine barley-meal may be added to the mash. Grit of fine quality must be regularly supplied from the time the chicks leave the shell.

Value of Insect Food.—There is nothing so wholesome for the chicks as insect food. Dried ants and ants' eggs are often used by those who rear pheasants and guinea fowls, but in many districts, especially where the soil is sandy, there are ant-hills in the fields. In such farms it is only necessary to place the coop in which they are kept near an ant-hill and the chicks will feed greedily on the insects and their eggs. It is worth while to have a light coop with a wire bottom made, and the hen and chicks can be placed in this and laid over an ant-hill which has previously been stirred up and levelled with a spade.

Young guinea fowls are naturally insectivorous, and when

hatched out in the woods and fields they live very largely on flies, grasshoppers, moths, and grubs of all kinds. These being their natural foods, the more of them that can be given to the chicks in a state of domestication the healthier they will be. It is therefore advisable that when a few weeks old the chicks should be given a free run with the old hen, and the best kind of range for them is an overgrown, weed-covered garden, orchard, or shrubbery. In such a place they can find as much insect food as they need to keep them in health; but if the run is small, or if too many birds are kept on it, it becomes necessary to feed guinea chicks with a small quantity of meat in their mash. One of the prepared meat foods or finely-chopped fresh meat and fresh bone may be used.

For table use guinea fowls are but little inferior to the pheasant. The flesh is somewhat dark, but has a decided gamey flavour, and is appreciated when game is out of season.

H. DE COURCY.

AREA OF WOODLANDS IN GREAT BRITAIN.

In connection with the Agricultural Returns of the present year special inquiries were made with the view of ascertaining the extent of land now occupied by woods in Great Britain, in pursuance of a recommendation by the recent Departmental Committee on British Forestry that a return should be obtained by the Board in continuation of that in 1895. The difficulties of securing an exhaustive return of all land under wood have been pointed out in commenting on the previous returns of this nature, but it is believed that the special pains taken by the officers of Inland Revenue in the distribution and collection of the schedules have resulted in rendering the present return substantially accurate. It is to be observed, however, that in some instances the inclusion of woodland areas, which were formerly overlooked, may tend to vitiate comparisons with previous figures for particular counties or districts, and may account to some extent for apparent increases in the areas returned.*

The woodland area is now returned under the several cate-

* The figures are given for each County in the Agricultural Returns (Acreage and Live Stock) 1905. Price 6d.

gories of (1) Coppice, *i.e.*, woods, whether containing standards or not, that are entirely cut over periodically and reproduce themselves naturally by stool shoots; (2) Plantations, *i.e.*, land planted or re-planted within the last ten years; and (3) "Other Woods," which include all land (not returned as coppice or plantation) used altogether or mainly for the growth of wood (other than orchards).

Summarising the new returns geographically in the groups of counties usually adopted for the purposes of the Agricultural Returns, the woodland acreage of 1905 was distributed as follows:—

Divisions.	Coppice.	Plantations (since 1895).	Other Woods.	Total Woodlands.
	Acres.	Acres.	Acres.	Acres.
I.—Eastern and North-Eastern	47,159	11,297	189,038	247,494
II.—South-Eastern and East Midland	270,683	15,580	318,303	604,566
III.—West Midland and South-Western	184,618	16,156	268,815	469,589
IV.—Northern and North-Western	35,663	16,614	341,547	393,824
ENGLAND...	538,123	59,647	1,117,703	1,715,473
V.—WALES	15,733	8,629	159,999	184,361
VI.—SCOTLAND (Eastern) ...	8,645	22,768	421,489	452,902
VII.—SCOTLAND (Western) ...	14,370	12,639	388,498	415,507
GREAT BRITAIN ...	576,871	103,683	2,087,689	2,7 8,243

The present total area thus shown in Great Britain, 2,768,243. acres, is 42,127 acres in excess of that returned ten years ago. This extension was, however, confined to England and Wales, the total area of woods in Scotland showing a decline of 10,356 acres. The decrease north of the Tweed has occurred notwithstanding the fact that 35,407 acres of land are returned as having been planted or re-planted during the past ten years, so that it would appear that the clearance of woodland areas by storms and from other causes has been considerably greater than the owners of land have been able to make good.

Some indication of the extent of planting or re-planting which has apparently taken place within the past twenty-four years may perhaps be given by comparing the returns of plantations collected for 1891, 1895, and 1905 respectively. The areas

planted or re-planted in the three periods for the agricultural divisions above referred to are given in the next table.

It will be noted that whereas the earlier and later periods extended over ten years, the intermediate period embraced only four years. By dividing the figures in each case by the numbers of years represented, the apparent average annual rate of planting thus obtained may be considered to indicate approximately the relative amount of activity in woodland extension during each period. Subject to the caution already given as to the possibility of more complete returns, it would appear that planting was carried on in Great Britain, as a whole, during the past decade at the rate of 10,368 acres per annum as compared with 8,225 acres during 1891–5, and 9,894 acres during 1881–91.

Divisions.	1881 to 1891.	1891 to 1895.	1895 to 1905.
	Acres.	Acres.	Acres.
I.—Eastern and North-Eastern ..	5,879	3,145	11,297
II.—South-Eastern and East Midland ...	12,481	4,176	15,580
III.—West Midland and South-Western...	14,270	4,484	16,156
IV.—Northern and North-Western ...	14,643	4,156	16,614
ENGLAND	47,273	15,961	59,647
V.—WALES	11,120	2,533	8,629
VI.—SCOTLAND (Eastern)...	19,957	8,335	22,768
VII.—SCOTLAND (Western)	20,590	6,074	12,639
GREAT BRITAIN ...	98,940	32,903	103,683

This tendency to reduced activity in the middle period, followed by greater activity after 1895, is suggested both in England (as a whole) and in Wales. In the Eastern Counties, as well as in the group of counties lying on the Welsh Border, there is a suggestion of continuously progressive activity during the whole twenty-four years, but in all other parts of the country the general indication is in the direction just mentioned. In Scotland experience seems to have been more varied. In the Eastern and Lowland division the rate of planting has, on the whole, increased, whereas in the Western and Highland division it seems to have substantially diminished. This seems to be largely due to some exceptional activity in Inverness and Ross and Cromarty during the decade 1881–91.

Quality in Potatoes.

Little attention has up to the present been given to the conditions which influence the culinary properties of potatoes. Their food value is almost entirely dependent upon the starch content, and extensive analyses have been made to determine the amount of starch in the potato and its proportion to other substances and to water. The protein, starch, and fat content, and the presence of other substances which influence flavour and colour, have also been investigated, and it is upon the considerations of starch content and other chemical properties that the estimation of quality has usually been made. The standard of chemical composition is fairly adequate when only the utility of potatoes for the manufacture of starch is considered or when they are used as food for stock, and even when used for human consumption the starch content must be considered, for when this is deficient or falls below a certain standard (about 17 per cent.) the indications are that the tubers have not developed properly, have not ripened, or have grown under adverse conditions of soil or climate. Their culinary value, however, must vary with the taste and opinion of different persons, but, generally, tubers white in colour, floury and mealy when cooked are preferred. The farmer, also, when growing for the market, must take into account such factors as size, colour of skin, shape, &c., all of which influence the sale and the price obtained.

With a view of elucidating some of the factors in the growth and development of potatoes which affect their culinary quality, some investigations* have been carried out by Mr. John W. Gilmore, of the Cornell Agricultural Experiment Station, which appear to show that the culinary and dietetic quality of potatoes is not dependent upon chemical composition so much as it is upon the anatomical and, perhaps, physiological characteristics of the tuber and the arrangement and distribution of starch and water areas in its substance. Thus, in general, mealiness follows upon the presence of sufficient starch in the cell to rupture its walls when boiled in water. The grains of potato starch expand and coalesce when boiled, and if the cells are sufficiently full of these bodies the boiling will

* Bulletin 230, June, 1905. Cornell Experiment Station.

cause the cellular structure to be broken down, and a degree of mealiness is the result.

The structural character of the tubers is influenced by the conditions of the soil and climate in which the potatoes grow. As a result of these investigations, it is believed that the quality of mealiness in a potato when boiled, and to a considerable extent the flavour, is influenced in the main by the following considerations: (1) the daily range of soil and atmospheric temperature during the growing period; (2) the degree of ripeness of the tuber when the plant dies; and (3) the physical condition and type of the soil.

In 1903 it was ascertained by careful examination that tubers growing at different depths varied in cooking quality, and that the structural characteristics varied with the depth. In 1904 potatoes were planted on experimental plots at depths of two, four, and six inches. The temperature and moisture of the soil at the different depths were recorded, and at shallow depths the variations in both were found to be considerable. The difference between the mean temperature at different depths over twenty-four hours was small, but it was observed that a curve of the temperature at intervals of two hours showed that the temperature at two inches runs considerably higher and lower than at the other depths. This wide variation of the hourly temperatures and comparatively uniform temperatures for the twenty-four hours between the different depths points to the conclusion that the quality of the tuber is not so much affected by the sum total of the temperature units, within reasonable limits, as it is by the hourly variations of temperature during the growing season.

In the same way the percentage of moisture was found to vary more at the depth of two inches, and, as might be expected, was much lower than in the deeper layers, the averages for the season being 13·27 at two inches, 15·12 at four inches, 15·91 at six inches, and 15·69 at eight inches.

What are precisely the best conditions will form the subject of further investigations, but the results obtained up to the present point admit of the following suggestions being made:—

1. Tubers grow out upon a short stem or stalk from the plant stem at regular nodes above the planted tuber. It is

therefore necessary to plant five or six inches deep (in good soil) in order that the plant may have room enough to form nodes to accommodate the tubers which it is able to bear.

2. If planted deeper than six inches the moisture and temperature conditions are unsuitable for the development of tubers on the first one or two nodes. The tubers are undersized, immature, and somewhat prone to scabbiness.

3. If planted shallower than three inches the variation in temperature and moisture is too great for proper development. The tubers are crowded, and there is a large proportion of small, compound, exposed and scabby tubers, and also a tendency to produce tubers on the stalk.

4. Tubers growing between the depths of one and a-half inches and four inches are of more uniformly good quality in appearance and cooking, in good size and development, than those growing deeper or shallower.

5. Long tubers which grow sloping in the ground will show a difference in cooking quality between the end nearest the surface and the stem end, the latter part being more mealy when cooked.

6. Though it cannot be stated definitely, it is believed that good quality is developed under a uniform soil temperature of 65–75 degrees, while great fluctuation in temperature is detrimental to the best development. Tubers growing one and two to five inches below the surface occupy, therefore, a better position in this respect than those growing above the one-and-a-half-inch level.

Remedy for Flea Beetles.*

A method of combating the Turnip Flea Beetle (Turnip "Fly") which might be useful in garden practice is described in the *Deutsche Landwirtschaftliche Presse.* The seed sown should be covered only very thinly with soil, which should be lightly compressed. The whole bed should then receive a covering, about finger-thick, of white sand. If the sand is not white

* See also "Experiments in the Prevention of the Turnip Fly" (*Journal,* April, 1905, p. 38), and "Experiments in the Prevention of the Cabbage Flea" (*Journal,* August, 1905, p. 298).

enough some finely-powdered quicklime may be mixed with it, so that the bright colour is conspicuous. Observation appears to show that the whole secret of the method lies in the bright colour, which the flea beetles dislike. The instinct of self-preservation, which here plays a part, warns the beetles that when they spring from the plants on to a light coloured ground they will be at once seen and devoured by their natural enemies, the birds. The sand, which quickly dries, also hinders the beetles in their movements, as it shifts from under their feet, so that they become tired and are more easily caught. It is said that wherever this method has been put in practice it has proved satisfactory.

Note as to Earwigs.

Earwigs are nocturnal insects, and it is only at night that they move about freely. During the daytime they hide in crevices, dark corners, garden rubbish heaps, litter of all kinds, in chinks between woodwork, in window frames, &c., or in any sheltered dark place. From these shelter places the earwigs issue at night for feeding.

The easiest and most successful method of dealing with the pests is by trapping. Advantage should be taken of the hiding habit of the insect by placing near wherever they occur inverted flower-pots stuck upon sticks pressed into the ground, or little upturned baskets inverted on sticks. Into these upturned receptacles dry moss or tissue paper should be pushed. These will act as traps, and will be most readily used as shelter places if some small pieces of apple be added. The traps must be visited daily in the daytime and the receptacles shaken over a vessel containing boiling water or a little paraffin.

Adulteration of Sulphate of Copper.

Sulphate of copper, commonly known as "blue vitriol," or "blue stone," is used agriculturally for several purposes. Combined with lime in the form of Bordeaux mixture, it is a most effective fungicide, and its value as a remedy for potato disease (Leaflet No. 23), peach leaf curl (Leaflet No. 120), apple and pear scab (Leaflet No. 131), and

many other fungoid attacks, is well known, whilst solutions of this substance in water at varying strengths are used for the prevention of bunt and smut on cereals (Leaflet No. 92), for the destruction of charlock (Leaflet No. 63), and for the cure of foot-rot in sheep (Leaflet No. 154).

In purchasing sulphate of copper care should be taken to demand a product of 98 per cent. purity, material offered as "agricultural" sulphate of copper being avoided.

The usual adulterant of sulphate of copper is sulphate of iron, which is much cheaper. An easy test for the presence of iron in the sulphate of copper is to dissolve a little in water and add ammonia with constant stirring until a deep blue liquid forms; any quantity of brown flocks floating about in this blue liquid indicates the presence of so much iron that the material should be subjected to a proper analysis previous to rejection.

A case has recently been brought under the notice of the Board in which sulphate of copper purchased for the prevention of "smut" proved on analysis at the Government Laboratory to have the following composition:—

	Per cent.
Crystallised Sulphate of Copper ("blue vitriol") ...	17·6
,, ,, Iron ("green vitriol")	82·4
	100·0

This grossly adulterated substance was sold as "blue vitriol," and, needless to say, was practically useless for the purpose for which it was intended. The suspicions of the farmer by whom it was bought were aroused by the fact that wheat dressed with it was spoilt by smutty ears. The presence of iron sulphate in anything like as large a quantity as above indicated makes the mixture much lighter in colour than good "blue vitriol."

The Board would direct the attention of farmers to the importance of requiring a guarantee from the seller that the material supplied has a purity of 98 per cent. As a further safeguard the simple test suggested above should be made, as the use of an adulterated article can only result in a considerable loss.

Experiments in Sheep and Cattle Feeding.

An experiment in sheep-feeding was conducted by the Edinburgh and East of Scotland College of Agriculture during the winter 1904-05, for the purpose of re-testing the results obtained in an experiment conducted during the previous winter. In the first experiment 228, and in the second 132 sheep were divided into six lots. The sheep used in both cases were "half-bred" hoggets. The chief object of the experiments was to ascertain the most profitable feeding-stuff to use along with hay and turnips for sheep-feeding. The second experiment has practically confirmed in every respect the results obtained in the first experiment.

Bombay cotton-cake at £4 6s. 8d. per ton in the first experiment, and at £4 12s. 6d. in the second, proved to be the most profitable feeding-stuff, a striking feature in both years being the quality of the mutton produced by this cake, as, except in one case, it secured the highest price in the London market.

Linseed-cake at £7 6s. 8d. and £7 9s. 7d. came next to Bombay cotton-cake. This feeding-stuff gave the greatest increase in both years though not at the smallest cost.

A mixture of equal parts of Bombay cotton-cake and dried distillery grains proved in both years to be a successful feeding-stuff. Nevertheless, the substitution of dried grains at £5 1s. 8d. for Bombay cotton-cake in the first experiment, reduced the profit as compared with the Bombay cotton-cake itself. This was also the case in 1905 with dried grains at £5 7s. 1d. At current prices this popular feeding-stuff seems to be dearer than either Bombay cotton-cake or linseed-cake.

A mixture of equal parts of decorticated cotton-cake and dried grains gave in both years indifferent results, and took only the fourth place. The monetary difference between this mixture and Bombay cotton-cake amounted to about a pound per acre of turnips consumed.

In the first experiment a mixture of wheat, cotton-cake, and seed, blended to imitate the composition of linseed-cake, did so badly that it was not continued. In the second experiment Egyptian cotton-cake was used instead. This cake at £5 4s. 7d. per ton was the least profitable of the feeding-stuffs tested in the

experiment. The difference between it and Bombay cotton-cake at £4 12s. 6d. was £1 6s. on a consumption of 15 cwt. of each feeding-stuff along with about 13 tons of turnips, live-weight increase being produced by the Bombay cotton-cake at £1 3s. 1d. per cwt., against £1 6s. 7d. by the Egyptian. The superiority of the Bombay cotton-cake over the Egyptian cotton-cake is also shown in the cattle-feeding experiment referred to below.

In every case, however, comparison of the lots which received concentrated feeding-stuffs with the one fed on turnips and hay alone shows that a profit resulted from the use of the former

The use of concentrated feeding-stuffs effected no saving in the consumption of turnips. In fact, it seems in some cases to have stimulated the appetites of the sheep for more turnips.

On the whole these experiments show that in the winter feeding of half-bred hoggets, a gross outlay of about £1 12s. for food, or when manurial residue is deducted, of £1 5s, is required for every hundredweight of increase in live weight. This calculation allows 10s. per ton for turnips and £3 10s. for hay.

Mr. W. Bruce, in reporting on these experiments, observes that it seems a doubtful policy to force on sheep of this class by increasing the allowance of concentrated feeding-stuff much beyond ¾ lb. per day, though with the present demand for light sheep the feeding should commence sufficiently early, and be controlled so as to have the sheep fat before they are too heavy.

He adds that a mixture of two or more feeding-stuffs is likely to do better than one. A mixture of Bombay cotton-cake and linseed-cake seems eminently suitable as a concentrated food for the winter feeding of hoggets. At the commencement the Bombay cotton-cake should either predominate or be used alone, but later a gradual change should be made to a mixture of equal parts of both feeding-stuffs. The results obtained last winter with another lot of about 200 sheep fed experimentally, under the auspices of the College, point to the same conclusion. These experiments indicate that this will be true generally, so long as Bombay cotton-cake can be bought at less or even the same price per unit as dried grain, decorticated cotton-cake, and

Egyptian cotton-cake. Linseed-cake seems to be worth about 1½d. more per unit than Bombay cotton-cake.

An experiment has also been conducted by the College for the purpose of testing the relative merits of Bombay cotton-cake, Egyptian cotton-cake, and decorticated cotton-cake by feeding equal weights of them to lots of eight two-year-old Irish cattle. It was conducted during winter, when the cattle were receiving turnips and straw *ad libitum*.

The cattle weighed about 9¾ cwt. at the commencement of the experiment. They cost £15, or 30s. 6d. per live cwt. During the twenty weeks it lasted they increased fully 2½ cwt., at a net cost of £2 2s. 6d. per cwt. with decorticated cotton-cake, £2 0s. 9½d. with Egyptian cotton-cake, and £1 19s. 6d. with Bombay cotton-cake. At the termination of the experiment the cattle were fat, and realised 34s. per live cwt. These results show that with this class of cattle live-weight increase may be taken as costing fully £2 per cwt., and in order to have a reasonable profit the feeder would require to buy his store cattle at about 5s. less per cwt. than the price he sells them at when fat.

Bombay cotton-cake proved more effective per unit than Egyptian cotton-cake, as in the case of the sheep-feeding experiment described above, and these experiments show that for feeding cattle and sheep Egyptian cotton-cake is not worth more per ton than Bombay cotton-cake.

Mr. Bruce states that Bombay cotton-cake was found a cheap, safe, and suitable food for starting the winter feeding of two-year-old bullocks which are receiving a liberal ration of turnips. About 6 lb. per head per day, however, is probably about the maximum quantity it is advisable to use. When the feed of concentrated food rises above this quantity the Bombay cotton-cake should be supplemented by a food containing more oil—*e.g.*, linseed-cake.

In regard to the purchase of feeding-stuffs, the experience of the College indicates that there is considerable variation in the quality of the samples on the market, and it is suggested that purchasers should pay far greater attention to their composition than they commonly do when purchasing them.

A comparison of the results of the experiments both in the

feeding of cattle and sheep shows that sheep-feeding paid much better than cattle-feeding. In 1904-5 the sheep left £1 14s. more than the cattle per acre of 20 tons of turnips, and in the previous year the difference was considerably greater than this.*

Oil Cake and Farmyard Manure.

In comparing the relative value of high and low grade linseed cakes it is frequently stated that a high grade cake, rich in oil, gives better manure than a lower grade containing a smaller proportion.

There are several reasons why rich oil cake might *a priori* be expected to yield better manure than poor oil cake. In making a rich cake the seeds are subjected to a certain pressure to extract part of the oil, whilst for poor cake solvents are used in addition, and afterwards displaced by steam.

For the purpose of testing the comparative values of the two substances, experiments have been carried out by Messrs. G J. Goodwin and E. J. Russell at the South-Eastern Agricultural College, Wye.

Two red polled bullocks were selected by the farm authorities as being as nearly alike as they could find ; the animals were kept in separate adjoining covered boxes of approximately the same size, supplied with the same amount of litter, and fed on the same ration. Both food and litter were analysed. Samples of the well-trodden manure were taken during the experiment, and also at the conclusion, when the dung was taken out, weighed and spread on to potato land.

The results are discussed in considerable detail in the report, but analysis failed to reveal any difference between dung made from rich oil cake and that from poor oil cake, the rest of the ration being the same in both cases.

Among the subsidiary questions arising out of the experiment, some of the most important from a practical point of view are involved in the loss of nitrogen. The dung was made in a covered box, there was sufficient but not too much

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* With regard to comparative value of Bombay and Egyptian cotton cake, reference may be made to an experiment reported in this *Journal*, Aug., 1904, p. 289.

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litter, it was well trodden to a firm, compact mass ; all the conditions, in fact, for preserving it from decomposition appeared to be observed, and yet in spite of this nearly 15 per cent. of the nitrogen was lost.

It appears, then, that in the circumstances above described the normal loss of nitrogen is about 15 per cent., and this apparently cannot be reduced, though it may easily be increased. The changes bringing about the loss have been much discussed but are not yet understood. The loss is more serious than it appears, for, in addition to the 15 per cent. mentioned, a certain amount of the easily available ammoniacal nitrogen is converted into slowly available insoluble bodies.

These experiments also afforded an opportunity for comparing the relative value of peat moss and straw as litter, as owing to a fire at the farm it was necessary to buy all the straw. The same price was paid for both, viz., £2 per ton.

The two chief manurial functions of litter are to add fertilising material to the manure, and to retain volatile, but valuable, nitrogenous compounds.

As regards the addition of fertilising matter, analysis of the two substances gave the following percentages :—

	Peat Moss.	Straw.
Nitrogen	·83	·49
Phosphoric acid	·10	·32
Potash	·17	1·64

Peat moss, it will be seen, contains more nitrogen than straw, but less phosphoric acid and much less potash. This important point needs to be fully emphasised ; farmyard manure made with straw litter, contains sufficient potash for ordinary purposes, and potassic manures in consequence are not much needed. But when peat moss is substituted for straw, there is no longer a sufficiency of potash, and these manures must therefore be applied ; they are very cheap and the saving in nitrogen more than recompenses the farmer for his outlay.

With regard to the absorptive power of the two substances, it has been pointed out above that the minimum loss of nitrogen in good farming practice is not less than 15 per cent. It is easy to exceed this, and 30 or 40 per cent. would not improbably be lost in many cases. Both straw and peat, in common with other cellulose substances, have the power of absorbing ammonia,

though in various degrees, and in these experiments the absorptive power of the peat moss was found to be five times as great as of the straw. From the standpoint of the value of the manure produced, therefore, peat moss is much better than straw as litter, owing to its higher nitrogen content and its greater power of absorbing ammonia.

Breeding Centres in Denmark.

Among the steps which have been taken in recent years in Denmark with a view to the improvement of the breeds of dairy cattle, the establishment of what are known as "breeding centres" may be mentioned. It has been recognised that for dairying purposes the limited means of judging afforded by exhibition at a show are insufficient to secure the selection of the most productive stock, as the judgment rests chiefly on points of appearance, shape, colour, and external characteristics. The evidence as to average milk production at the show itself may be more or less trustworthy, but evidence as to past performances is not usually available, or, if available, not taken into account. Especially in the case of bulls it has been urged that judgment should not rest entirely on their appearance but that hereditary transmission of milking qualities should be taken into account. The steps taken in this country to obviate some of these objections have chiefly taken the form of milk and butter test trials* at certain shows, while in Denmark the existence of the "Control" system† of recording yields has afforded a means of comparison in these respects which does not always exist elsewhere, and advantage has been taken of it to improve the general level of dairy cattle in the country by encouraging the formation of good herds of high productive capabilities. With this object the Royal Danish Agricultural Society recommended the Government in 1897 to recognise by means of an official certificate herds of this character of the Red Danish and Jutland breeds.

The farms or herds were to be selected by competition extending over eighteen months, and the certificate was only

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* *Journal*, Dec., 1902, p. 297.
† *Journal*, April, 1905, p. 21.

to be awarded to such as showed a high general excellence, both as regards external features and productiveness. The regulations included the following points: (1) The herds were to be maintained chiefly by home breeding, especially on the female side; (2) the object which was to be borne in mind in the competition was the selection of herds likely to improve the standard of breeding in the country; (3) records were to be kept on an approved system and the whole herd managed in a rational manner.

The country was divided into several districts, and three judges appointed to inspect the competing farms in each district. Notice of the competition was given in the papers and a preliminary inspection made by the judges, at which any unsuitable farms were struck out. After that each farm was inspected three times annually, at each of which any of them could be eliminated. The judges have the services of an assistant, who visits each farm monthly.

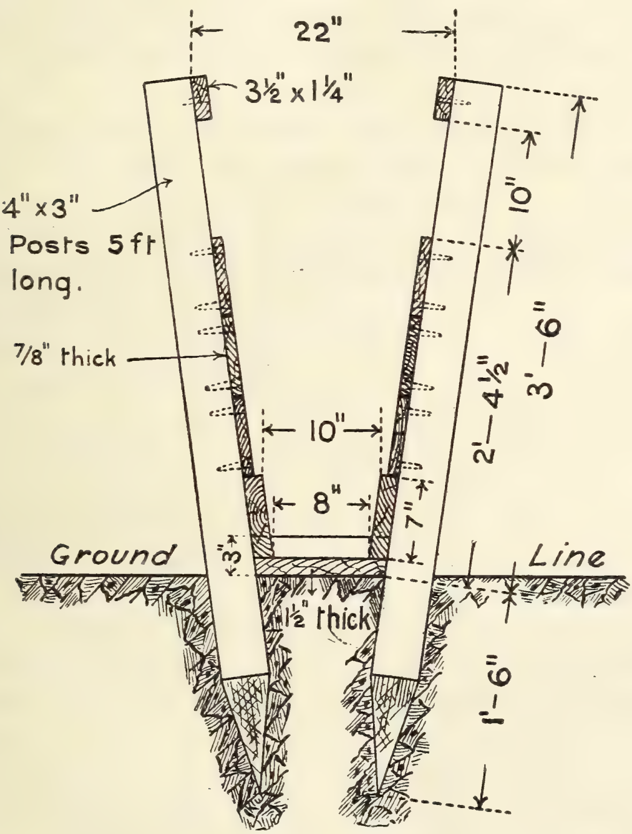
In the final classification the judges are required not only to take account of the external characteristics and of the pedigree of the animals, but to consider the actual results in regard to milk yield, fat content, and food consumption, ascertained by the assistant at his monthly visits.

Forty farms in four provinces entered for the first competition, of which twenty-five were included in the final judging by the provincial judges. These were then inspected by a special committee, and, as a result, six farms were nominated as breeding centres, receiving premiums of from £83 to £167. In addition, fifteen farms were awarded premiums of £16 each in order to encourage them to enter for a subsequent competition. The farms receiving prizes continue under the control of a committee and are required to keep records as before. The sale of breeding animals from these herds is unrestricted in Denmark except in regard to such bulls as may be specified by the committee as "special breeders." These animals may not be disposed of without permission from the Ministry, and the sale of bulls abroad is similarly only allowed by special permission.

Foot-Rot Bath.

In connection with the directions which have been issued by the Board as to the prevention and cure of Foot-Rot in Sheep* (Leaflet No. 154), the following sketch has been prepared, showing the elevation of the suggested foot-rot bath.

The bath itself may be made of wood or concrete, and



should be about 16 ft. long. The width at the bottom should be 8 in., the sides about 7 in. high, sloping outwards, and if made of wood, boards about 1½ or 1¼ in. thick should be used. The ends should be 3 in. deep, or a little more than shown in

* *Journal*, April, 1905, p. 40 and Sept., 1905 p. 360.

the sketch, but deep enough to retain the solution while allowing the sheep to step over them easily. The bottom of the trough, if of wood, should have cross pieces nailed or screwed on at intervals of about a foot to prevent slipping. The floor of a concrete bath should be supplied with transverse grooves.

The sides above the trough should be nailed to posts 4 in. by 3 in. and 5 ft. long, driven firmly into the ground, 4 ft. apart. The run thus made should be wide enough to allow the sheep to walk freely through, and a width of 18 in. at 2 ft. from the ground will be found sufficient even for in-lamb ewes.

The Board have received through the Foreign Office the following regulations governing the importation of live stock into Spain:—

Live Stock Import Regulations—Spain.*

According to the Public Health Act (Chapter XI., Section II.) of Spain, horses, mules, asses, cattle, sheep, goats, and swine are subject to sanitary inspection at the port of entry into Spain by sea. The same measures may be extended to other animals if considered necessary, especially to dogs.

The inspection at ports will be made, if the captain of the vessel wishes it, before the disembarkation of the animals, provided that the veterinary officer can carry out the inspection without prejudice to its thoroughness; otherwise it will take place after disembarkation.

At ports where no sanitary service exists, importers of cattle will be required to provide certificates of origin and bills of health for their cattle, indicating their quality, number, and marks.

The certificate must emanate from a veterinary surgeon and be legalised by a Spanish Consul or Consular agent, or in his absence by the local authority of the district from which the cattle come, and must certify that for six weeks previous to their despatch no contagious disease has appeared among animals of the species included in the consignment. The certificate must be presented to the proper authority within three days.

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* Live stock import regulations have been published in this *Journal* for the following countries:—Transvaal, March, 1903; United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, August, 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; and Victoria, Nov., 1905.

The Ministry of the Interior and the Director-General of Public Health reserve the right of taking every precaution in the case of animals capable of transmitting infection, either by detaining them in quarantine, prohibiting their entry, or ordering their immediate slaughter without the importers being entitled to any compensation.

The following regulations included in Chapter IV. of the Customs Orders of 1894 also affect the introduction of live stock into Spain. In accordance with the Royal Orders of the Ministry of the Interior, dated December 31st, 1887, September 6th 1888, and January 16th and February 6th, 1889, the introduction into Spain of cattle, sheep, goats, and swine from abroad can be effected at Custom ports of the first class.

The consignments on arrival will be inspected by a veterinary officer specially appointed for the purpose. Consignments of cattle not completely free from epizootic disease may not be landed, and must be re-exported in forty-eight hours. In case of other disease only such of the cattle as are free from it may be imported for consumption.

Cattle on being imported must not be slaughtered for public consumption within ten days of their arrival. The disembarkation or introduction of cattle will not be allowed unless it be ascertained that the importer has in readiness, and approved by the competent authorities, the requisite accommodation for the cattle during the above-mentioned period. Milch cows which are passed as healthy are exempted from this provisional detention of ten days.

Influence of Food on Milk.

Many experiments have been made in recent years with a view to test the influence of food on the yield of butter-fat in cows' milk, and the conclusion arrived at, stated in general terms, has been that the amount of butter-fat a cow gives is not materially dependent upon the nature of her food, but is governed by other causes, such as the period of lactation and the individual characteristics of the cow, together with such influences as inclement weather and under-feeding in winter. At the same time, as was pointed out in

connection with some experiments at the Wisconsin Experiment Station,* there is evidence to show that feeding-stuffs of a nitrogenous character, like oil cake, &c., have a beneficial effect on the quality of the milk produced, and that in general the best quality and also the largest quantity of milk which a cow is capable of producing will be obtained by the use of foods fairly rich in protein.

In the case of cows which have been insufficiently or poorly fed, however, it is reasonable to expect that a more liberal feeding would increase the percentage of fat up to a point limited by the individual characteristics of each cow, beyond which no additional feeding would be likely to have any effect. Experiments in this direction were carried out by the Cornell Experiment Station for four years from March, 1900. A herd which had the reputation of being insufficiently fed was selected containing twenty-one cows; of these only four were more than eight years old, all but one had calved within two months of one another, and all were very thin. A record of the production of the herd in milk and fat was then kept for one entire lactation period on the farm of the owner without in any way changing the conditions under which the animals had lived. At the close of this lactation period, ten cows from the herd were purchased and brought to the University, where they were fed liberally for two years, records of production being constantly kept as before. At the end of the two years, seven cows (three had been disposed of) were returned to the farm from which they were purchased and kept under conditions practically identical with those of the first year, and records kept as before. Thus the experiment was divided into three parts: (1) on a private farm, one lactation period; (2) at the University, two lactation periods; and (3) on the private farm again, for one lactation period.

The records were begun at the farm on March 28th, 1900. From that date till May 16th the cows received a moderate feed of timothy hay, with a very little clover in it, and about 4 lb. a day of a mixture of gluten feed and wheat bran or middlings. They were then turned on to pasture which was poor and became very scanty after July 1st; the grain ration,

* *Journal*, June, 1905, p. 167. See also June, 1904, p. 166; June, 1902, p. 51.

however, was continued till September 1st, after which the cows only got what apple pomace they would eat besides the very scant pasture. The cows were brought to the University early in November, 1900. They were then dry and very thin. During the winter they were given as much ensilage and hay as they would eat and 6 lb. of grain daily. As soon as they freshened, which was in most cases in March and April, the grain ration was increased, till each cow was getting all she would readily consume, and this was continued the whole season, both in the stable and on pasture, till the flow of milk diminished. The amount given was in most cases 12 lb. per day, though one cow ate 14 lb. per day, for three months The foods used were cottonseed meal, wheat bran, gluten feed, buckwheat, middlings, and linseed oil meal. While the cows were dry, between the second and third periods, they were given hay and ensilage, but no grain. In the third lactation period they were fed much as they were in the second period as to kind and combination of food, the chief change being that in the latter part of this period malt sprouts formed a considerable part of the grain ration. The amount of grain, however, was materially reduced, the idea being that the food given should bear some relation to yield of milk; 8 lb. per day was the maximum, except for one cow that was given 10 lb. a day, for about a month. In the fourth period, when the cows were returned to the farm, they were fed practically the same as in 1900. The pasture, however, was very much better because of abundant rains, and no grain was given after July 1st.

The average percentage of fat in the milk of each cow in each season was as follows :—

Name of Cow.	1900. At Farm. Per cent.	1901. At University. Per cent.	1902. At University. Per cent.	1903. At Farm. Per cent.
Chloe	4·26	3·98	—	—
Clover	4·31	4·80	—	—
Dena	4·82	5·39	5·08	5·00
Dinah	4·22	4·24	—	—
Patty	4·27	4·79	4·54	4·25
Polly	5·64	6·26	5·89	6·25
Rena	3·66	3·82	3·69	3·44
Rita	3·92	4·34	4·15	3·90
Stella	5·22	5·31	4·90	4·79
Tilda	3·71	3·76	3·81	3·41

It will be seen that there was considerable variation in the percentage of fat in the various periods. In order to determine the effect of the more liberal feeding, the figures for the first and fourth periods have been averaged and compared with the average of the second and third periods. This shows that on the whole the milk was one-quarter of 1 per cent. richer in fat during the whole time the cows were on a liberal diet. Further, each cow, without exception, gave richer milk, and it would seem that in the case of these seven cows, which were previously in a low condition and not giving their maximum yield, the percentage of fat was increased by the influence of more and better food.

Name of Cow.	Average percentage of Fat in Milk, 1st and 4th Periods.	Average percentage of Fat in Milk, 2nd and 3rd Periods.	Gain.	
			Actual.	Per cent.
Dena	4·91	5·24	·33	6.7
Patty	4·26	4·67	·41	9·6
Polly	5·95	6·08	·13	2·2
Rena	3·55	3·76	·21	5·9
Rita	3·91	4·25	·34	8·7
Stella	5·01	5·11	·10	2·0
Tilda	3·56	3·79	·23	6·5
Average ...			·25	5·9

The increase in fat was most marked in the second period ; in the third period there was a reduction, and in the fourth period most of the cows gave poorer milk than in the first. On this latter point it is remarked that the cows which had remained at the farm during the whole period were also found to give lower percentages in 1903 than in 1900, and it is therefore thought that the fall was not due to the change in conditions.

Comparing the first and second periods alone, the individuality of the various cows is very noticeable, five of them showing a gain varying between ·62 per cent. and ·42 per cent. of fat, while four gained from ·16 to ·02 per cent. only, and one lost ·28 per cent. of fat.

The total yield of both milk and fat was in nearly every case very much increased while the cows were at the University, and this fact illustrates the capacity of many cows for increased

production under more liberal treatment. The average weekly production of milk in 1901 was increased by 46 per cent. and of butter-fat by 54½ per cent. compared with 1900. It must be remembered that the cows were not selected on account of any apparent capacity to improve, but were taken as representative of the whole herd. The increased yield was maintained during the third period, when the ration, though still liberal, was materially reduced, but declined again to about the original amount when the cows returned to their former scanty diet.

With regard to the relative cost of production under the three methods, it is estimated that the value of the food consumed per 100 lb. of milk produced was 2s. 2½d. in 1900 (underfeeding), 2s. 8½d. in 1901 (very liberal feeding), and 1s. 10½d. in 1902 (moderate feeding). The production, therefore, in the third year was not only greater, but was obtained at a cheaper rate than under a system of grazing on poor pasture or feeding on hay alone with but little addition of more nutritive materials.

Tests for Farmers' Milk.*

With reference to the arrangements which have been made in many counties for the testing of farmers' milk (see Leaflet 146), the Board are now informed that the Agricultural Sub-Committee of the Gloucestershire County Council have arranged that farmers desirous of acquainting themselves with the character of their milk can have the percentage of butter-fat determined in any sample of milk at the County Council Dairy School, Gloucester, for a fee of sixpence.

Apple Growing in New York State.

Many agricultural problems admit of two methods of solution. On the one hand they may be tested experimentally on small plots by a trained scientific staff, or the methods adopted by farmers in actual practice may be considered and the results compared over a large area. The latter method, if means were available and opportunity offered, would often serve a most useful purpose, but it is rarely that investiga-

* *Journal*, March, 1905, p. 743, and April, 1905, p. 47.

tions on this scale can be undertaken. An experiment in this direction was made in the United States in 1903, when a survey of the apple orchards of Wayne County, New York, was undertaken on behalf of the Cornell Experiment Station. An interesting Report on the results has been prepared by Mr. G. F. Warren, by whom much of the work was carried out, which, in addition to giving us a broad picture of the industry in this part of the State, serves to indicate the success or otherwise which has attended different methods of orchard management. Three districts were selected, and a minute examination of the orchards in each was carried out ; in one every orchard as large as an acre was examined, and in nearly every case the owner was asked to furnish particulars as to varieties, age, methods of cultivation, spraying, yield, prices, &c. In the other two districts every orchard as large as ten acres and also a number of smaller ones were examined.

In the first place, it may be noted that New York State contained, according to the Census of 1900, some 15,000,000 apple trees of bearing age, and took the leading place as an apple-producing State. Wayne County itself contained some 796,000 trees, occupying approximately 19,000 acres, and since then the area has increased by 2,000 acres. The last few years, it is stated, have seen a rapid improvement in orchard management. Ten years ago orchards were quite commonly considered to be an unprofitable investment, but a gradual improvement has been taking place, and has been reflected in the increased profits, until apples are now looked upon as one of the principal money-producing crops of the county.

Comparative Yields of Cultivated and Grass Orchards.—About 70 per cent. of the orchard area was in grass, and only 30 per cent. cultivated. The comparative yield in bushels, taking the average of four years (1900-1903), under the different methods was as follows :—

	Bushels.
Tilled for five years or more	266
Tilled most years	229
Grass most years, tilled occasionally	202
Grass for five years or more	148

It will be seen that the tilled orchards have given a uniformly larger yield than those in grass, the four-year average being 80

per cent. higher. In this respect the figures for the separate years and also for separate districts are entirely uniform. Part of the difference may be due to other factors; for instance, a man who regularly cultivates his orchard may be more likely to manure it and to spray and prune the trees. In order to eliminate this as far as possible the figures for a number of orchards, all well cared for, have been taken out separately :—

	Bushels.
Tilled for five years or more	271
Tilled most years	245
Grass most years	209
Grass five years or more	200

Of these well-cared-for orchards the tilled ones gave an average of 35 per cent. above the untilled. It is, of course, recognised that grass has some marked advantages; for example, less labour is required, spraying machines can be hauled over grass more easily than over cultivated land, and where the apples are shaken off the tree they are less damaged by falling on grass, while by the liberal use of farmyard manure the orchard may be kept in good condition. Under ordinary conditions, however, it is evident from the figures given above that the yield of apples obtained from grass orchards is much less than that from cultivated ones, thus entirely confirming the results of the experiments on this point at Woburn.*

Orchards in New York are, it appears, commonly ploughed in autumn, but it is considered that the best method is to plough in the spring, and to sow in the summer a crop which can be ploughed in as green manure.

If stock are allowed to graze in the orchard it is considered that pigs give the best results, sheep take the second place, but cattle and horses are decidedly injurious.

Manures.—The majority of the orchards examined received no artificial manure, but were given a limited amout of farmyard manure. The records do not cover any long period, but it was found that the average yield of manured orchards for the years 1902 and 1903 were 55 bushels per acre above that of those that were unmanured.

In this connection it is pointed out that the mistake is frequently made of applying manure in a small circle round the

* See Third Report of Woburn Experiment Station.

base of the tree, whereas, since the small feeding roots are most numerous at some distance from the tree, it should be distributed over the whole area. The importance of green manuring is particularly emphasised, as the soil in many orchards was found deficient in humus.

Spraying.—A large part of the crop in this county is used for evaporating, and for this purpose the same price is very often paid for apples regardless of their condition as regards apple scab. In consequence, about one-third of the orchards are seldom or never sprayed; in 1903, 41 per cent. of the bearing trees were sprayed. The damage from insects and the apple scab in 1903 was much less than usual, but even in that year of few insects and little fungus, when most people "saw nothing to spray for," spraying was found to pay. The average yield of the sprayed orchards was 27 bushels more per acre than that of the unsprayed. The average price of 8,430 barrels of sprayed apples was 8s. 4½d. per barrel, and of 6,365 barrels of unsprayed apples 7s. 6d. per barrel, and the average price of sprayed apples for evaporating was also higher, 110,445 bushels (sprayed), averaging 1s. 4d. a bushel, and 96,345 bushels (unsprayed), 1s. 2d. a bushel. The income per acre from the sprayed orchards was £16 3s. 11d., and from the unsprayed ones only £13 2s. 6d. Most of the sprayed orchards were treated but once, and apples from many of these brought no higher prices than unsprayed ones, but some of those that were well sprayed gave very much better yields and secured much higher prices. Arsenical washes are most used, but the principles of spraying are not apparently very well understood.*

Distance of Trees Apart.—Great importance is attached to the

* In this connection the following simple explanation of the different kinds of spraying solutions may be reproduced:—

There are three general classes of sprays: (1) poisons; (2) sprays that kill insects by contact; and (3) fungicides.

The insects that bite are the only orchard enemies that we can expect to kill with Paris green, arsenic, or other poisons of this nature. Lice, San José scale, aphides, and other insects that suck their food, are not hurt by poisons, for the very simple reason that they cannot eat poison. We would not expect to kill a mosquito by putting poison on the hand and letting him suck the blood from under it—his food, the blood, is not poisoned. These insects feed in a similar manner. They suck the juices from the plant and do not take any material from the surface. They may be killed by paraffin, whale-oil soap, lime salt and sulphur, or some other spray that kills by contact. Only those that are struck by the spray are killed.

The various fungi are plants. We might call them weeds that have chosen to grow on the apple. They cannot eat Paris green, nor are they killed by paraffin and similar sprays. For them some fungicide, such as Bordeaux mixture, must be used.

distance apart at which the trees are planted. The varieties chiefly grown are Baldwins and Greenings, and it is considered that mature trees of these varieties should be 40 by 40 ft. apart. As indicating the injurious effect of close planting, the average returns over four years from a large number of orchards were collected, which showed a yield of 186 bushels at a distance of 30 by 30 ft.; of 222 bushels at a distance of 35 by 35 ft., and of 229 bushels over that distance. Trees that are too close together, it is remarked, furnish favourable conditions for insect and fungoid attacks, are more difficult to spray, the apples are more difficult to pick and are of poorer quality and colour, and, finally, the lower limbs of the tree suffer from want of light.

In addition to the points which have been summarised above, the Report contains information respecting pruning, age of trees, soils, elevation, drainage, varieties, insect pests and fungi, yields and prices, together with a separate section dealing with the geology of the district. A similar survey has also been carried out of the orchards in Orleans County, in New York State, where the conditions are somewhat different. The later enquiry, however, entirely supports the points which have been referred to above as regards the value of tillage, spraying, manuring, distance of trees apart, &c.

An interesting account is given of the "renovation" of an old apple orchard, undertaken in 1896. This orchard consisted of eleven acres, forming part of a small farm which had been neglected and was bought at a cheap rate. On two acres of the orchard the trees had been killed by standing water, owing to defective drainage, but on the remaining nine acres the trees were thirty-two years old, and should have been just entering their prime. They had been greatly neglected, but the work of renovation was vigorously undertaken. The water was drained off, the land ploughed, the trees freed from dead wood, the worst cankered limbs removed, and the whole liberally sprayed with Bordeaux mixture and arsenic. The method of cultivation was as follows:—

1896.—Orchard in grass; mown.
1897.—Orchard ploughed and beans grown.
1898.—Orchard manured; beans grown, followed by crimson clover.
1899.—Orchard manured and crimson clover ploughed in.
1900-1904.—Orchard manured every year and buckwheat grown.

During the last three years every tree in the orchard received each year a quarter load of manure, to which was added 12 lb. of a fertiliser in 1904 containing 8 per cent. of potash and 10 per cent. phosphoric acid. Spraying was done regularly three times a year, and sometimes more, with Bordeaux mixture and Paris green.

The orchard may now well be called a "rejuvenated" orchard, for hardly any of the old tree tops exist. The Kings, Greenings, and Russets have grown entirely new tops in the course of the eight years, and the Baldwins are doing so, though at a slower rate.

A detailed account of expenditure and receipts in 1904 shows that 1,840 barrels of apples were sold for £567 3s. 9d.; the expenses of cultivation amounted to £71 3s., the cost of the barrels £138, and the cost of harvesting, packing, and carriage to station amounted to £95 17s., leaving a balance of £262 3s. 9d. It is stated that these charges include "wear and tear" of machinery, &c., but no interest on capital, and that every hour of work done in the orchard by the owner or his men has been charged. The gross returns from the orchard in each year have been as follows :—1896, £52; 1897, £2 10s.; 1898, £167; 1899, £42; 1900, £250; 1901, £62; 1992, £412; 1903, £292; and 1904, £567. On the whole there has been a gradual increase in the amount of the crop; the cost of production and marketing cannot be given for each year, and naturally varies with the size of the crop.

Cultivation of Vines.

The Board have been furnished with the following brief suggestions as to vine cultivation by Mr. J. Wright, Horticultural Instructor of the Surrey Education Committee :—

1. The main stem of vines (called rods) should not be less than 3 ft. apart. A vine may have *one* or *more* rods at that distance.

2. The side growths (called "laterals") from the rods, ought not to be less than a foot apart along each side. They will not occur at regular intervals, but 15 in. is a good average.

3. If the "laterals" are as thick as a man's fourth finger, each may carry one bunch of grapes and no more, removing others

as soon as the berries are seen to be swelling and the lateral is safe from breakage; then also rub off any extra laterals.

4. When a promising bunch shows on the young growth, pinch the point off the shoot at one leaf *beyond* the bunch at a time when that leaf is the size of a shilling.

5. Growths which push out *after* the first pinching (called "sub-laterals") should be treated exactly the same—nipping off the end promptly above the shilling-sized leaf as often as it forms. This prevents the great evil of overcrowding and leaf spoliation.

6. The six or seven large uncrowded leaves on each lateral give substance and quality to the fruit and strength to the vine; a crushing mass of small leaves means trashy fruit and exhaustion of the vine.

7. When the young grapes are about peppercorn size, clip out sufficient with narrow-pointed "grape scissors" so that those left have about ¾ in. of space between them. These must not be rubbed in any way whatever. This thinning must always be done before the berries touch, and no good grapes can be had without it.

8. When the leaves fall in the autumn (and the grapes are cut) shorten each lateral, leaving only two buds at the base for forming a "spur" on the main "rod" for affording fruit another year. That is the time also for cutting boldly out any excess "rods" for securing the best at the distances named in (1).

If pruning is deferred till the spring, vines suffer through "bleeding."

Insect on Pines.

The Board have recently received portions of two coniferous trees (*Abies nordmanniana* and *A. nobilis*) which were found to be dying owing to their being infested by an insect pest. They were submitted to expert examination, and have been reported on as follows:—

The specimens in question have been infected with *Chermes piceæ*, a genus of the aphides family. It is quite probable that this insect on the *Abies* is only an emigrant generation, the progenitors of which came from small galls on the spruce, *Picea*

excelsa (just as the larch aphis is an emigrant generation from the large cone-like galls on the spruce). In view of this, attention should be given to the spruce, and any young galls should, where possible, be removed and burned. It is not an uncommon sight to see spruces laden with such galls, each of which is a centre of infestation for larch, pine, and firs. About October, when the return of the *Chermes* to the spruce may be expected for egg-laying, from which will come the gall-making generation, the trees should be sprayed with paraffin emulsion. As the trees are at that time passing into the winter-resting condition they would not be likely to be much harmed, and there would be the great advantage of killing the egg-laying females—the starting-points of the new cycle. If it is thought that the trees will bear it (which is doubtful in bad cases), the winter wash recommended for fruit trees in Leaflet No. 70 may be tried.* Whatever be used it is certain that the eggs will not be affected, and, therefore, in early spring recourse should again be had to the paraffin emulsion, which is prepared as follows:—

Add 3 lb. of soft soap to 1 gallon of boiling water. Boil these, and while still boiling hot pour into 2 gallons of paraffin. Churn thoroughly (this is very important) until a butter-like mass results. For use dilute with ten times the quantity of water.

If well made, and given an occasional stir, the "stock" will keep for a very long time.

Forestry Diploma at Cambrdge.†

The Syndicate appointed by the Senate of Cambridge University to consider the desirability of establishing in the University a diploma in forestry have recommended that such a diploma should be established, and that it should be granted to candidates who have (*a*) been admitted to a degree in the University; (*b*) passed an approved preliminary examination

* This winter wash is prepared by first dissolving 1 lb, of commercial caustic soda in water, then 1 lb. of crude potash in water. When both have been dissolved mix the two well together, then add ¾ lb. of soft soap or agricultural treacle, stir well, and add sufficient water to make up to 10 gallons.

† For previous notes as to Forestry Education, see *Journal*, April, 1904, p. 1, and March, 1905, p. 751.

or examinations including certain branches of natural science; (*c*) attended for a time equivalent to one academical year approved courses of instruction in practical forestry; and (*d*) passed the examination for the diploma in forestry and presented evidence of proficiency in practical forestry.

The Senate of Cambridge University have approved of these proposals, which were largely the outcome of the recommendations of the Departmental Committee on British Forestry and of the Departmental Committee on the Royal Engineering College at Cooper's Hill. In the minutes of evidence on which these reports were based, the desirability of establishing University courses of training in scientific forestry was repeatedly emphasised, and in both the reports recommendations were made in favour of Cambridge as a suitable place for the study of forestry.

With regard to the extent of woodland or land suitable for planting in the immediate neighbourhood of Cambridge, it appears that several Colleges may be able materially to assist forestry instruction in the University by placing woods and plantations at the disposal of teachers in forestry. Landowners in the Eastern Counties have also been approached, and several have offered the use of considerable areas of woodland for demonstration purposes. There are over 1,000 acres of woods within one hour by rail from Cambridge. These woods are chiefly in the Newmarket district, but there are over 200 acres near Old North Road Station, within a few miles of Cambridge At a somewhat greater distance, but within easy reach, are the Woburn Woods of the Duke of Bedford and the Crown Woods in Northamptonshire.

Surveyors' Institution Scholarships at Cambridge.

The Senate of Cambridge University have accepted the offer of the Surveyors' Institution to establish three scholarships at the University of a value of £80 each and tenable for three years. They will be open only to students of the Surveyors' Institution. The prescribed course of study will be as follows: (*a*) every scholar must take the first part of the natural science tripos and the examina-

tions for the University diploma in agriculture, and (*b*) every scholar must take chemistry and botany as two of his subjects in the first part of the natural science tripos, and in addition one at least of the following:—Physics, mineralogy, geology, zoology and comparative anatomy, physiology.

Election to the scholarships is to be by a competitive examination held annually at Cambridge in July in (*a*) elementary chemistry and physics, and (*b*) more advanced chemistry, physics, botany, and geology. No candidate will be allowed to take more than two of the advanced subjects.

New German Tariff.

Under the new German tariff, which comes into force on 1st March, 1906, the import duties on cereals, flour, and potatoes will be raised. In the following table the present rates per ton of 1,000 kilos. (2,204 lb.) are given with the new rates for comparison:—

Article.	Under Existing Tariff.	Under New General Tariff.	Conventional Tariff.	Wholesale Price at Berlin per Ton of 2,204 lb., December, 1904
	£ s.	£ s.	£ s.	£ s. d.
Rye	1 15	3 10	2 10	7 2 6
Wheat	1 15	3 15	2 15	8 18 0
Spelt	1 15	3 15	2 15	—
Barley—				
Malting	1 0	3 10	2 0	8 15 0
Other	1 0	3 10	0 13	7 0 6
Oats	1 8	3 10	2 10	6 18 5
Potatoes—				
From February 15th to July 31st ...	Free	1 5	0 10	—*
From August 1st to February 14th ...	Free	Free	Free	

The conventional tariff applies to imports from countries, including the United Kingdom, having most-favoured-nation treatment.

[*Foreign Office Report, Annual Series, No.* 3,506.]

* Edible potatoes £3 1s.; potatoes used for manufacturing purposes, £2 6s. 8d.

Miscellaneous Notes.

Prohibition of Export of Maize from Roumania.—The Board are informed through the Foreign Office that the prohibition on the exportation of maize from Roumania* was removed on the 28th of November last. The Roumanian Minister of Agriculture has informed His Majesty's Minister at Bucharest that the maize crop this year amounts to about sixty million bushels, so that, the annual consumption in the country being about forty two million bushels, there will remain a surplus of nearly eighteen million bushels, which he considered to be sufficient.

In regard to this year's wheat, the production is put at ninety-eight million bushels, which is stated to be much beyond the average.

Inspection of Nurseries in Cape Colony.—With the object of checking the dissemination of insect pests and plant diseases in Cape Colony, an Act, dated June 3rd, 1905, has been promulgated, providing for the inspection and quarantine of nurseries. Every nursery is to be inspected at least once a year, and the inspector is to inform the nurseryman what pests and other injurious insects and plant diseases he has observed and what measures he recommends for their suppression and eradication. In the case of what are called general nurseries, *i.e.*, nurseries selling plants outside the local boundaries, such parts as are found to be infested with certain pests may be declared in quarantine pending the application of remedial treatment.

No trees, plants, or fruit are to be introduced into the Colony until they have been properly inspected and declared free from any pest. All infected trees, plants, or fruit may be destroyed. A summary of the general regulations as to the importation of plants into the Cape is given in this *Journal*, September, 1903, and October, 1904.

Wool Production in Uruguay.—His Majesty's Consul at Monte Video (Mr. Kestell-Cornish) reports that there has been a satisfactory increase in the output of wool in Uruguay in the year 1904, the value of the exports in that year being £2,221,450, as compared with £2,209,086 in 1903. As regards the season 1904–5 just ended, he says that during the period from 1st October, 1904, to 15th July, 1905, 66,000 bales were exported

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* *Journal*, August, 1904, p. 277, and October, 1905, p. 420.

through Monte Video, and 13,000 bales through the other Uruguayan ports and *viâ* Buenos Ayres. Taking 470 kilos. (1,036 lb.) per bale, this means a total of 37,130,000 kilos. (81,834,500 lb.), and on the basis of 200 dols. per bale, after payment of Custom dues, the value of the above quantity equals 15,800,000 dols., or £3,361,702. The wool shipped from Monte Video in the year 1903-4 amounted to 65,389 bales.

[*Foreign Office, Annual Series*, 3,515.]

Quebracho Wood in Argentina.—With reference to the article in this *Journal* on "Quebracho Wood in Argentina" (Vol. XI., p. 562, December, 1904), the Foreign Office have now issued a Report (Miscellaneous Series No. 639) on quebracho and cotton in the Argentine Chaco, by Mr. Consul Ross. Mr. Ross gives an account of the district from which the quebracho wood is obtained, together with an estimate of the cost, and other particulars. The demand for this material for tanning has, it appears, so increased that the price is now 50 per cent. higher than it was a year or two back, the United States and Germany being the principal consumers. The export, in the form of logs, is somewhat fluctuating, and does not show any great increase during the last few years; 240,000 tons being sent away in 1900, 199,000 tons in 1901, 246,000 tons in 1902, 200,000 tons in 1903, and 252,000 tons in 1904. The export of quebracho extract, which is worth £16 12s. per ton, has increased rapidly, 4,320 tons being exported in 1901 and 20,000 tons in 1904. The quantities consigned to the United Kingdom in 1904 only amounted to 1,400 tons of extract and 100 tons of logs.

Agricultural Exhibition in the Dominican Republic.—According to the *Moniteur Officiel du Commerce* (Paris), the Government of the Dominican Republic have decided to organise an exhibition at Santo Domingo of native products and foreign agricultural implements.

Spanish Duties on Wheat and Forage.—According to the *Gaceta de Madrid* for the 14th September, the duties fixed by the Law of the 14th March, 1904, have been re-imposed (viz., wheat, 6 pesetas, and wheat flour 10 pesetas per 100 kilogs.), in consequence of the price of wheat falling below 28 pesetas per 100 kilogs. The full duties inscribed in the Tariff (8 and

13·2 pesetas per 100 kilogs., respectively) are to be re-imposed in the event of the price of wheat in the markets of Castile further falling below 27 pesetas per 100 kilogs.

The *Gaceta de Madrid* for the 12th August contains the text of a Royal Decree suspending the import duty on forage imported into Spain until the 31st March next.

Mushroom Spawn.—The *Board of Trade Journal* states that a Montreal correspondent wishes to hear from British producers of fresh mushroom spawn, of which he seeks large supplies For further information application should be made to the Canadian Government City Trade Branch, 73, Basinghall Street, E.C.

Agricultural Machinery in Siberia.—The British Commercial Agent in Russia (Mr. Henry Cooke), states that the importation of agricultural machinery into Siberia has greatly increased of late years. In 1897 the value only amounted to about £56,000, whereas in 1903 agricultural machinery to the value of £1,000,000 was imported. According to the *Commercial and Industrial Gazette* of St. Petersburg, most of it is bought by the peasants on credit terms from the local depôts.

Loan of Books from the Board's Library.—The Board will be willing under certain circumstances to lend books from their Library for short periods not exceeding fourteen days to Students of Agricultural Colleges and others for purposes of study and research. Application should be made by letter to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.

The works in the Library may be consulted at the Offices of the Board on any week-day between the hours of 11 a.m. and 5 p.m. (Saturdays 11 a.m. to 2 p.m).

ADDITIONS TO LIBRARY DURING NOVEMBER.

Australasia—

Queensland.—Department of Agriculture and Stock. Report for 1904-5. (137 pp.)

Queensland.—Trustees of the Agricultural Bank for 1904-5. (3 pp.) 1905.

Tasmania.—Minister of Lands, Works, Railways, and Agriculture. Ministerial Statement. 1905. (17 pp.)

Belgium—

Severin, G.—Le Rôle de l'entomologie en Sylviculture. (11 pp.) 1903. Psilura Monacha. (26 pp.) Le genre Retinia. (23 pp.) Le genre Hylobius. (24 pp.) Le genre Pissodes. (27 pp.) Le genre Lophyrus. (22 pp.)

Canada—

Central Experimental Farm.—Bull. 51. Bacon Pigs in Canada. (61 pp.) 1905. Bull. 52. Insects Injurious to Grain and Fodder Crops, Root Crops, and Vegetables. (48 pp. + viii. plates.) 1905.

Department of Agriculture, British Columbia.—Bull. 17. Strawberry-Growing. (24 pp.) 1905.

Denmark—

Rostrup, E.—Tidsskrift for Landbrugets Planteavl. Vol. 12. Part I. (224 pp.)

Germany—

Hollrung, Dr. M.—Jahresbericht über die Neurungen und Leistungen auf dem Gebiete der Pflanzenkrankheiten, 1904. (347 pp.) 1905.

Kaiserliche Bio'ogische Anstalt für Land - und Forstwirtschaft.—Arbeiten. Heft 2. Studien über das Gebiss mitteleuropäischer recente Mäuse. (97 pp.) 1905.

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 110. Vorprüfung neuer Molkereigeräte der Wanderausstellung zu Danzig, 1904. (79 pp.) 1905.

Heft 111.—Die Braunheubereitung (91 pp.) 1905.

Heft 112.—Messungen an Hengsten, Stuten und Gebrauchspferden. (234 pp.) 1905.

Kirchner, Dr. O.—Die Krankheiten und Beschädigungen unserer landwirtschaftlichen Kulturpflanzen. 3 Lieferung (*see Journal, Vol. XI.*, pp. 313 and 377). (193–288 pp.) [The subsequent parts will be added to the Library as issued.]

Great Britain—

The Horse: Its Treatment in Health and Disease, edited by J. Wortley Axe. Divisional Volume I. (164 pp.) 1905. [Eight subsequent volumes will be added to the Library as issued.]

Hall, A. D.—The Book of the Rothamsted Experiments. (294 pp.) 1905.

West of Scotland Agricultural College.—Bull. 34. Experiments on the Seeding of Potatoes, Report. (93–115 pp.) 1905.

Edinburgh and East of Scotland College of Agriculture.—Manuring of Seeds Hay. Report for 1904. (21 pp.)

Holland—

Departement van Landbouw.—De Landbouw in Denemarken. (85 pp.) 1905.

India—

Civil Veterinary Department.—Report for 1904–5. (33 pp.) 1905.

Central Provinces.—Report on the Experimental Farms for 1904–5. (32 pp.) 1905.

South America—

British Guiana.—Board of Agriculture, Report for 1904–5. (26 pp.) 1905.

United States—

Bureau of Animal Industry:—

Bull. 73. Bacteria of pasteurized and unpasteurized Milk under Laboratory Conditions. (32 pp.) 1905.

Bull. 77. Cattle, Sheep, and Hog Feeding in Europe. (98 pp.) 1905.

Biological Survey.—Bull. 22. Birds known to eat the Boll Weevil. (16 pp.) 1905.

Bureau of Chemistry.—Bull. 97. Studies on Peaches. (32 pp.) 1905.

Bureau of Plant Industry.—Bull. 84. The Seeds of the Bluegrasses. (37 pp.) 1905.

Bureau of Soils.—Bull. 29. Tobacco Investigations in Ohio. (38 pp.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of November, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt. †
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 10	7 1	36 6	33 6
Herefords	7 7	6 11	—	—
Shorthorns	7 5	6 10	35 6	32 8
Devons	7 8	6 10	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7½	6¾	8¼	6¾
Sheep :—				
Downs	8¾	8	—	—
Longwools	8¼	7½	—	—
Cheviots	8¾	8¼	8¾	7¾
Blackfaced	8¼	7½	8¼	7½
Cross-breds	8½	7¾	8¾	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 11	6 6	6 9	5 11
Porkers	7 7	7 1	7 4	6 5
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 8	18 0	21 17	16 3
,, —Calvers ...	20 13	16 17	17 14	15 12
Other breeds—In Milk ...	17 8	15 0	20 1	16 3
,, —Calvers ...	18 7	13 16	19 4	14 19
Calves for Rearing	2 0	1 12	2 6	1 12
Store Cattle :—				
Shorthorns—Yearlings ...	9 0	7 14	9 3	7 13
,, Two-year-olds	12 5	11 1	13 14	11 12
,, Three-year-olds	15 5	13 17	13 15	12 7
Polled Scots—Two-year-olds	—	—	14 8	11 16
Herefords— ,,	14 15	14 3	—	—
Devons— ,,	12 3	10 13	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	38 7	33 9	—	—
Scotch Cross-breds ...	—	—	28 10	24 2
Store Pigs :—				
Under 4 months	27 1	20 2	22 4	16 6

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	46 6	46 0	43 0	—	54 6*	52 6*
	2nd	43 0	40 6	38 6	—	53 0*	43 6*
Cow and Bull ...	1st	—	38 0	36 6	35 6	40 6	35 0
	2nd	—	31 6	31 6	31 6	31 6	29 0
U.S.A. and Canadian :—							
Birkenhead killed	1st	45 0	42 6	41 6	42 0	41 6	43 0
	2nd	38 6	36 6	37 0	36 6	36 0	36 0
Argentine Frozen—							
Hind Quarters ...	1st	29 0	30 0	29 0	29 0	30 6	32 0
Fore ,, ...	1st	25 6	26 0	24 6	24 6	27 0	27 0
Argentine Chilled—							
Hind Quarters ...	1st	32 0	34 0	33 0	33 0	—	34 0
Fore ,, ...	1st	25 6	28 0	25 6	25 6	—	29 0
American Chilled—							
Hind Quarters ...	1st	49 0	49 0	48 6	48 0	50 6	51 0
Fore ,, ...	1st	28 6	32 6	31 6	31 6	33 6	33 0
VEAL :—							
British	1st	68 6	57 0	61 6	66 6	—	—
	2nd	57 6	48 0	54 6	61 0	—	—
Foreign	1st	67 0	—	—	—	—	65 6
MUTTON :—							
Scotch	1st	68 6	65 6	69 6	69 0	71 0	66 6
	2nd	63 6	54 0	64 6	65 6	55 0	54 0
English	1st	64 0	66 6	66 0	62 0	—	—
	2nd	58 6	53 6	60 0	54 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	65 6	—	—	—	—
Argentine Frozen ...	1st	31 6	31 6	32 6	32 0	31 0	31 6
Australian ,, ...	1st	29 6	30 6	31 0	31 0	31 0	—
New Zealand ,, ...	1st	37 6	41 0	38 6	38 6	32 6	—
LAMB :—							
New Zealand ...	1st	41 0	47 6	42 0	40 6	42 6	—
Australian	1st	36 0	42 0	39 6	39 6	—	—
Argentine	1st	—	40 6	—	—	—	—
PORK :—							
British	1st	66 6	68 0	66 0	67 6	56 0	58 0
	2nd	57 6	60 6	60 6	63 0	53 6	48 0
Foreign	1st	63 6	60 0	59 6	59 6	—	53 6

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ...	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1	30 8	22 5	19 10	24 10	18 4	16 6	18 3
,, 20 ...	27 10	26 9	30 10	23 7	20 4	24 8	18 5	16 7	18 5
,, 27 ...	27 8	26 9	30 11	23 7	19 8	24 4	18 5	16 7	18 8
June 3 ...	27 6	26 10	31 3	23 10	18 8	23 6	18 4	16 8	19 1
,, 10 ...	27 8	26 6	31 4	21 5	18 5	24 0	18 7	16 10	18 11
,, 17 ...	27 6	26 5	31 7	20 7	18 2	26 0	18 3	16 8	19 1
,, 24 ...	27 6	26 5	31 7	22 0	19 2	23 9	18 6	16 10	18 10
July 1 ...	27 9	26 4	31 8	20 7	18 8	23 2	18 6	17 1	19 7
,, 8 ...	28 1	26 6	32 1	19 11	19 8	22 11	18 3	17 1	19 6
,, 15 ...	28 3	26 10	32 3	20 5	18 9	23 10	18 7	17 6	19 7
,, 22 ...	28 7	27 7	32 2	20 10	18 10	23 7	18 5	17 6	18 11
,, 29 ...	28 11	28 0	32 3	21 0	19 9	23 11	18 6	17 10	19 3
Aug. 5 ...	29 3	28 3	31 11	20 1	19 9	22 0	18 8	17 10	18 4
,, 12 ...	29 11	28 4	30 5	21 3	19 9	22 5	18 10	17 7	16 11
,, 19 ...	29 9	28 8	28 5	20 4	22 5	23 4	18 6	16 7	16 4
,, 26 ...	30 0	29 5	27 1	22 3	23 2	23 6	18 7	16 5	15 9
Sept. 2 ...	30 3	30 2	26 11	22 5	25 3	23 5	18 5	16 3	15 9
,, 9 ...	28 6	30 0	27 1	22 4	24 10	23 4	17 0	16 1	15 11
,, 16 ...	27 5	29 7	26 11	24 2	24 9	23 7	16 4	15 11	16 0
,, 23 ...	27 0	29 10	26 8	24 0	25 10	23 10	16 2	15 9	15 11
,, 30 ...	26 3	29 10	26 9	23 9	25 5	24 3	15 9	15 8	16 1
Oct. 7 ...	25 10	30 2	26 9	23 8	25 6	24 9	15 6	15 9	16 3
,, 14 ...	25 8	30 5	26 11	23 9	25 4	24 10	15 5	15 8	16 6
,, 21 ...	25 10	30 4	27 1	23 7	25 5	25 0	15 8	15 11	16 7
,, 28 ...	26 0	30 6	27 4	24 2	24 11	24 11	15 8	15 10	16 8
Nov. 4 ...	26 4	30 6	27 10	24 3	25 0	24 9	15 9	16 0	17 1
,, 11 ...	26 6	30 3	28 3	24 6	24 6	24 10	15 9	15 11	17 4
,, 18 ...	26 9	30 2	28 7	24 3	24 5	24 6	15 10	16 0	17 8
,, 25 ...	26 6	30 5	28 5	23 11	24 4	24 6	15 11	16 1	17 9
Dec. 2 ...	26 8	30 4	28 8	23 9	24 6	24 6	15 9	16 2	17 11
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		WHEAT.		BARLEY.		OATS.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	October ...	38 0	38 7	23 0	23 10	17 6	20 2
	November...	39 1	38 9	23 1	24 3	17 8	20 8
Paris:	October ...	40 4	39 6	23 3	24 2	18 11	20 9
	November...	40 4	39 11	23 3	25 1	19 1	21 7
Belgium:	September...	30 11	29 8	22 4	22 8	18 7	18 11
	October ...	31 6	30 6	23 0	22 10	19 9	20 0
Berlin:	September...	38 11	37 1	—	—	19 11	19 9
	October ...	38 9	—	—	—	19 7	—
Breslau:	September...	37 1	35 1	25 9	25 0	19 2	19 2
	October ...	36 7	—	25 7	—	18 5	—

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of November, 1904 and 1905.

—	WHEAT.		BARLEY.		OATS.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	30 9	29 8	23 11	25 4	17 2	18 8
Norwich	30 3	28 5	25 3	24 5	15 4	17 3
Peterborough ...	30 1	27 10	23 8	24 1	15 10	17 1
Lincoln	29 5	28 3	23 10	23 10	15 6	17 6
Doncaster	28 11	28 1	22 11	23 10	15 3	17 6
Salisbury	29 7	28 3	24 1	25 2	15 11	18 0

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER:—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	15 3	14 3	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	116 0	114 0	119 0	116 0	116 0	113 0	116 6	—
Danish ...	123 6	121 0	126 6	124 0	125 0	122 0	124 0	—
Russian ...	107 0	104 0	118 6	115 6	106 0	103 0	105 6	—
Australian ...	112 0	109 0	116 0	112 0	113 0	110 0	114 6	112 0
Argentine ...	113 6	111 6	—	—	116 0	112 0	116 0	—
CHEESE:—								
British, Cheddar	74 6	66 6	—	—	71 6	66 0	64 6	59 0
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	75 0	66 6	73 0	66 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	59 0	58 0	62 0	60 0	59 0	57 6	59 6	57 6
BACON:—								
Irish	65 0	61 0	66 0	62 6	63 6	60 0	63 6	61 0
Canadian ...	58 6	56 0	56 6	53 6	57 6	55 0	58 0	55 6
HAMS:—								
Cumberland ...	102 0	98 6	—	—	—	—	—	—
Irish	100 0	95 0	—	—	—	—	96 6	85 6
American (long cut) ...	53 6	51 0	52 0	47 0	51 6	48 0	53 0	51 0
EGGS:—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	18 9	17 6	—	—	—	—	—	—
Irish	17 11	14 7	13 10	12 5	13 10	12 11	12 7	11 10
Danish ...	15 1	12 7	15 9	14 0	14 0	13 4	13 9	13 1
POTATOES:—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen...	64 0	57 0	—	—	43 6	36 6	45 0	40 0
Scottish Triumph...	68 0	58 0	57 0	48 0	43 6	36 6	45 0	40 0
Up-to-Date ...	70 0	57 0	55 6	46 6	43 6	36 6	45 0	40 0
HAY:—								
Clover... ...	89 0	78 0	84 0	73 0	85 0	65 0	73 0	66 0
Meadow ...	79 0	66 6	70 0	67 6	—	—	70 6	65 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	November.		11 Months Ended November.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	45	46	725	1,125
Swine Slaughtered as diseased or exposed to infection ...	232	256	3,276	5,284
Anthrax :—				
Outbreaks	66	85	876	917
Animals attacked	70	98	1,209	1,378
Glanders (including Farcy) :—				
Outbreaks	77	100	1,103	1,403
Animals attacked	132	185	1,897	2,469
Sheep-Scab :—				
Outbreaks	65	64	778	1,179

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	November.		11 Months Ended November.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	2	—	48	180
Swine Slaughtered as diseased or exposed to infection ...	11	88	1,415	4,068
Anthrax :—				
Outbreaks	—	1	3	4
Animals attacked	—	4	3	7
Glanders (including Farcy) :—				
Outbreaks	3	1	28	11
Animals attacked	7	3	99	34
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	28	27	277	415

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XII. No. 10.

JANUARY, 1906. [NEW SERIES.]

A NEW MARKET FOR ENGLISH CIDER.

During the past twenty years there has been a continually increasing demand for English cider. Undoubtedly one of the most important factors responsible for the growing popularity of cider as a beverage has been the marked improvement in the quality of the product placed upon the market. In the eighteenth century the reputation of English cider stood at a very high point, but its position was not maintained during the nineteenth century and the general quality of the article appears to have deteriorated considerably in that period. With the decline in popularity there was a corresponding decline in the attention and care bestowed on the orchards of cider fruit trees, and the gradual replacement of old orchards by the planting of fresh areas with cider varieties was neglected. Accordingly, at the present time cider-makers in this country have not at their command a supply of raw material such as could be desired, or as befits an industry which is making rapid progress. In spite, however, of this drawback the standard of English cider has gradually risen during the past two decades owing to a revival of interest and the introduction of modern methods of manufacture. Not only in this country has the consumption of English cider increased during the last few years, but a growing trade is springing up with other countries. When it is stated that it has been sent with profitable and satisfactory results to parts of the world so varied in character as, for example, Australia, South America and South Africa, it will be seen that there are considerable possibilities for an export trade in the future.

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The object of this article is to draw attention to a new market for export trade which, by reason of its situation, offers few, if any, of the objections which arise in the case of most other markets abroad. In dealing with a product like cider, there are certain factors to be considered which determine largely the possibility or success of an export trade in that article. The most important, perhaps, are the facilities for export, the length of journey and the time occupied, the extremes of temperature to which the article is exposed during the journey and after arrival at its destination, the demand—either existing or capable of being created—for the article, and the price commanded.

The market thus referred to is Holland. An endeavour will be made to show, by an examination in turn of each of the points just mentioned, that it offers opportunities for trade probably unequalled by any other market abroad.

The demand naturally comes first for consideration. The place of cider as a beverage is intermediate between that of wine and beer. It is practically apple wine and, like all other wines, is characterised by possessing qualities of a fruity nature, which are due to the character of the raw material or fruit. Unlike wines made from grapes, pure cider, by which is meant cider made from apple juice, without any additions, is distinguished by the comparatively low percentage of alcohol which it contains. In this respect, therefore, it resembles beer. In fact, the average English cider does not as a rule contain much more than half the amount of alcohol contained in beer. In another respect also it resembles beer more than wine, in that it is usually more or less an incompletely fermented liquid, still retaining a certain amount of sweet and therefore fermentable material, while a typical wine is practically completely fermented. Thus cider as a beverage possesses the fruity character of a wine with the limited alcoholic strength of a light beer. It appeals, therefore, to those who desire a drink of the character of a wine and not of a malt liquor, and yet wish to avoid the alcoholic strength of the former in favour of something not heavier than the latter. The demand for cider depends mainly on this class in a country where wine and beer of excellent quality are both easily obtainable and comparatively cheap.

Cider has been consumed in Holland in fair quantity for many years. Its sources of supply have been threefold. In recent years a small amount of cider has been made in the country. On account, however, of the lack of special vintage varieties of apples in Holland, fruit not adapted for the particular purpose of cider-making has had to be used. The quality of the cider has been, accordingly, inferior, while efforts to improve it have not yielded satisfactory results. As a rule, the sweetness of the apple juice rapidly disappeared during the course of fermentation. Sugar was therefore added in sufficient quantity to furnish the desired amount of sweetness after fermentation had ceased. The necessary addition was so great that the amount of alcohol produced by the time fermentation had ceased was almost as much as in the lighter grades of grape wines. In other essential features quality was lacking, and thus the product could only be regarded as an inferior wine. Until better vintage varieties of fruit can be obtained the home supply will not meet or satisfy the demand.

The other sources of supply have been Germany and France. Each of these countries produces a characteristic cider. The German product is typically a dry, completely fermented cider with a rather high alcoholic content. French cider, made in the districts of Normandy and Brittany, has long held a very high reputation. Owing to the character of the vintage fruits, it possesses, perhaps more than any other cider, certain qualities of astringency and bitterness. Neither of these countries can be said to have supplied the Dutch with the particular type of cider which they require and for which there is an undoubted demand.

Dr. J. J. L. van Rijn, the Commissioner of Agriculture for Friesland in this country, having become acquainted with the character of English cider, recognised a few months ago the possibility of this article satisfying the demand for cider in Holland. Further steps were taken in the matter, and eventually an influential committee, presided over by Mr. F. B. Löhnis, Inspector of Agriculture in Holland, was formed by Mr. H. J. Lovink, Director-General of Agriculture, to organise an Exhibition of English ciders in Amsterdam. The objects of the Exhibition were:—

(*a*) To introduce English cider to the Dutch, with a view to open up a new source of supply.

(*b*) To supply information relating to the methods of cider-making in vogue in England.

(*c*) To ascertain the possibility of developing the industry in Holland.

With these ends in view, Mr. Eldred G. F. Walker and Mr. John Ettle were asked to get together a collection of English-made ciders, as representative as possible of the produce of this country, and to take charge of it at the Exhibition. The National Fruit and Cider Institute was also invited to lend its assistance, and to send an exhibit of ciders to illustrate its experimental work. Mr. John Ettle, F.R.H.S., the horticultural instructor of the Somerset County Council, and myself were asked to represent the Institute at the Exhibition, and to give information on the subjects of orchard management and cider-making respectively.

The Exhibition was held in Amsterdam at the beginning of last November in the large Hall at the Zoological Gardens, which had been kindly placed at the disposal of the committee by the authorities. The Dutch Department of Agriculture was represented at the opening ceremony by Mr. Lovink, the Director-General of Agriculture, in addition to Mr. Löhnis, the president of the committee. An excellent and thoroughly representative collection of English ciders had been brought together, thanks mainly to the energy of Mr. Walker and Mr. Ettle. All classes of cider-makers were represented, from the large makers and merchants to the smaller growers and makers and typical farmer cider-makers. Collective exhibits were sent by the Mid-Somerset Agricultural Society, the Berkeley Hunt Agricultural Society, and the Monmouthshire Cider School. The directors of the Brewers' Exhibition kindly placed at the disposal of the committee samples of each of the ciders exhibited in their cider competitions in October last, while the National Fruit and Cider Institute sent samples of seventy-two ciders, illustrating particularly the characters of English vintage fruit and their value for purposes of blending. In addition to the ciders a very fine collection of vintage fruit was shown, this having been previously exhibited at the Brewers' Exhibition and the Mid-Somerset Society's Apple Show, and afterwards sent on to Amsterdam by permission of the

authorities of these bodies. All expenses incurred were paid by the Dutch committee. The Exhibition also included a representative collection of ciders made in Holland and of other products prepared from apples.

During the three days over which the Exhibition extended it was visited by large numbers of people, and sampling of the various types of ciders was freely indulged in. Some of the ciders were also placed on sale in the restaurant adjoining the Hall in which the Exhibition was held. As far as could be judged from the demand for this cider and the opinions expressed after tasting it, there should be no difficulty in finding a ready sale for cider of similar quality in Holland.

On the first day of the Exhibition a conference was held, at which papers were read by the English representatives on subjects dealing with general aspects of the cider trade, the cultivation of cider fruit, and science as applied to cider-making. There was an attendance of two or three hundred people, and the reading of the papers was followed by a lengthy and vigorous discussion, covering a wide range of subjects connected with cider. In the end a resolution was passed, advocating the establishment of a Cider Institute in Holland for experiment and research on questions affecting cider-making and the culture of vintage fruit, on lines similar to those followed by the National Fruit and Cider Institute in this country.

The success which attended the Exhibition clearly shows that a considerable amount of interest in the cider trade is taken in Holland. Persons from all parts of the country visited it, and included not only those who were actively engaged in the trade, but also many who hoped to find in English cider the type of beverage which they desired, but had not hitherto been able to obtain. A general opinion that the bulk of the English cider tasted there would exactly meet the demand was freely expressed, one of the largest merchants stating that he could easily dispose of an almost unlimited amount of certain of the samples exhibited. Since the Exhibition was an educational affair and not a commercial undertaking, no orders for sales were allowed to be taken. Many applications for names of English makers of repute were received at the time, and since that date many others have also been made. In one instance,

at least, arrangements for the establishment of an agency in that country have recently been concluded. A leading merchant, who owns about thirty shops, has also offered to sell in each of his establishments the produce of any one English maker of standing for one year, without profit to himself, in return for the information which he learnt at the Exhibition. Another merchant has applied for permission to send his son as a pupil to the National Fruit and Cider Institute, so that he may study the most approved methods here. The samples of experimental ciders sent by this Institute have been forwarded by request to one of the Experimental Schools of Agriculture in Holland; while, in addition, samples sent by various makers have been placed in the Bureau for Colonial Produce in Amsterdam, where they can be tested by anyone desirous of doing so.

It is clear, therefore, that there exists in Holland at the present time a demand for English cider; that from the progress which has already been made there is a reasonable certainty that the demand will increase considerably as the article becomes better known; and that facilities to aid the further introduction of the product already exist.

The financial aspects of the question appear to be thoroughly satisfactory, assuming that certain arrangements on the lines of some suggestions, which will be considered later, can be made.

As far as the price commanded by a high-quality cider in Holland is concerned, it may be stated that the general market price for cider is at present decidedly higher than in this country, and that this price is obtainable for ciders which are of an inferior quality and not so well suited to the Dutch palate as those sent from here to the Exhibition. Cider is considered by the Dutch as a wine, and is used somewhat as such accordingly. The price which it commands is, therefore, similar to the prices obtained for the lower grades of wine. Like wine, however, a duty of one shilling and sixpence per gallon is imposed upon cider, and the high price obtainable is therefore counterbalanced by the effect of this duty. There is, however, considerable reason to suppose that as a result of representations made to the officials of the Dutch

Department of Agriculture at the time of the Exhibition, the duty on cider will be very much lowered, being reduced from that imposed on wines to that on beer. For reasons pointed out earlier, when considering the position of cider as a beverage, cider in such matters should be treated as allied to beer. Especially so is this the case with the average English cider, on account of its low alcoholic strength. Even if the duty remains at its present rate, from calculations which have been made in consultation with members of the trade, it may be stated that it is possible to send cider from the cider-making districts in the West of England to Holland and sell it at a satisfactory profit, making due allowances for all expenses incurred. Taking into consideration the possibility of the reduction of the duty and the likelihood of the present price of cider being at least maintained—and perhaps raised—by the introduction of a superior article, it will be seen that the outlook in this direction is promising.

The facilities for export and the length of the journey offer no serious disadvantages financially. Bristol may be claimed as the most central city in the cider districts of the West of England. This port is well served by railways from these districts, and is in direct communication by boat with Rotterdam and Amsterdam, the most important Dutch ports. A consignment of cider of the weight of one ton can be sent more cheaply thence to Holland than to London; and since the journey is very short in duration no great disadvantage arises on that score. At the same time, smaller consignments will incur proportionately greater expense for carriage, and, unless some special arrangements are made, this may prove a decided drawback to the trade in the case of the smaller makers.

Since the facilities for export are so convenient and the distance of the journey so short, the cider is not likely to suffer any more serious deterioration in quality during transit than when sent to different parts of this country. Moreover, on the score of the temperatures to which it may be exposed, no great drawback exists. Normally, the extremes of temperature during the journey will not be any greater than, if as great as, those to which it would be subject if it remained here. In Holland, during the summer months, the temperature as a rule is, perhaps,

rather higher than here, but since the cider would be sent at that period of the year for consumption rather than for storage, it ought not to suffer materially. During the other periods of the year the temperature is, on the whole, lower than in this country, and is therefore more favourable.

Having thus reviewed the factors which are most important in their bearing on the possibility of opening up an export trade with prospects of success, it will be noticed that no serious objection offers itself. From the point of view of competition the prospects are at the present time very favourable. It is true that one of the most important objects of the Cider Exhibition was to stimulate the home cider industry. The Dutch, however, cannot become serious competitors during the next decade or two. At present they possess no orchards planted with vintage fruit. Without such fruit they cannot hope to make cider to compete with that made from vintage varieties. If new orchards are planted at once with selected varieties they will not produce for the next ten or fifteen years sufficiently large crops to allow of much cider being made. In addition, it remains to be seen if the climate and soil will be suitable for vintage fruit. There is, therefore, ample opportunity for the trade to become well established before any serious local competition need be feared, and possibly then, also, the English product may be superior.

The type of cider which was in most demand at the Exhibition, and which presumably is the kind which will sell best, is the rather sweet, extremely fruity cider which is characteristic of certain districts of Somerset, although by no means confined entirely to those neighbourhoods. The brisker, lighter ciders of Hereford were equally well liked, when they possessed well-marked fruity characters. Probably, for the general taste, the degree of sweetness of the cider is immaterial as compared with the possession of the pronounced character of the fruit. At the same time, a rather sweet drink appears to be favoured. Neither acidity nor bitterness in a marked degree is liked, but both characters are appreciated when slightly marked. The great essential is the purity of the beverage. Sophisticated ciders are lacking in those features which are most appreciated, and can only in the end bring the name of English cider into disrepute. A cider produced from pure apple juice

alone, retaining as far as possible the aroma and flavour of the fruit, with some degree of sweetness, is the type which will probably command the largest sale and reputation.

What has been stated throughout this article regarding cider holds good equally for perry. The Exhibition included this beverage as well as cider, and the prospects for trade in this article are, perhaps, even more favourable than for cider, since it is as well liked as the latter and has much less competition to fear.

The larger merchants and makers should find little difficulty in opening up and carrying on trade with Holland, on account of the resources at their command. Much of the best cider in this country is produced, however, by smaller makers and farmers, who have neither the facilities nor the means for introducing their produce and conducting a paying independent trade. In such cases it appears as if a certain degree of co-operation will be needed for them to reap the benefit of the opening which is presented. It has been already stated that small consignments cannot be sent at the most profitable rates. If arrangements could be made, whereby several small independent lots could be despatched together as a single consignment, considerable advantage would be gained. Means of introduction and distribution in Holland are also required, and it is possible that this difficulty might be met by opening a co-operative depôt at Amsterdam or Rotterdam. A meeting of cider-makers has been already arranged by the National Fruit and Cider Institution—and by the time this article is published will have taken place—to consider the best means of developing the trade with Holland, and to organise, if possible, a suitable scheme for that end. It is to be hoped that the present opportunity which lies before one section of British agriculture will not be allowed to pass without full advantage being taken of it.

B. T. P. Barker.

IMPORTS OF AGRICULTURAL PRODUCE IN 1905.

The following tables, which have been compiled from the Trade and Navigation Accounts, show the quantities and value of the principal articles of agricultural produce imported into the United Kingdom during the past year.

The imports of cattle showed a further increase in 1905, and were larger than in any of the six preceding years. The United States and Canada are now practically the only sources of supply, the number of cattle received from the Channel Islands being insignificant. By far the larger portion come from the United States, that country being credited with 414,900 in 1905, compared with 401,200 in 1904, while Canada sent 148,700, against 146,600 in the preceding year. No live cattle now come from the Argentine Republic, but the trade in stock "on the hoof" has been replaced by a large and rapidly increasing export of fresh beef. The largest number of live cattle received in any one year from that country was 89,369 in 1898, when the exports of fresh beef only amounted to 108,000 cwt. Since then the quantity of beef has annually increased, and amounted in 1905 to 2,580,000 cwt., which, estimating the average production of meat from Argentine cattle at 720 lb. per head, is equal to an importation of 401,300 head of live cattle. The United States, which contributes to the beef supply of the United Kingdom not only in the form of live animals but also by refrigerated meat, occupied for the first time in 1905 the second place in point of quantity in the chilled meat trade, as her consignments to this country only amounted to 2,232,000 cwt., thus falling short of the Argentine quota given above and of the consignments of 1903 and 1904, which were 2,694,000 cwt. and 2,396,000 cwt. respectively. The United States meat, however, fetched a much better price than the Argentine product, the average value of the former being 43s. 2d, as against 29s. 1d. per cwt. for the latter.

The total imports of fresh beef amounted to 5,037,500 cwt., a quantity larger than in any previous year; the total weight of beef represented by the imports of cattle may be estimated at 3,678,400 cwt., so that the total receipts of meat of this class from abroad in 1905 was 8,716,000 cwt., or about 22½lb. per head

of the population. The declared value of the fresh beef imported was 35s. 5d. per cwt., as compared with 37s. in 1904 and 40s. 3d. in 1903. Live cattle averaged £17 2s. 1d. per head, as against £17 14s. 4d. in 1904.

The imports of live sheep showed a somewhat noticeable decline from 382,200 in 1904 to 183,100 in 1905, this being the smallest number recorded since 1893. There was some increase in the quantity of fresh mutton received. As in the beef trade, the imports of mutton from Argentina (1,462,400 cwt.) have become of increasing importance, and more than compensate for loss of the former trade in live sheep. They were in the past year only slightly exceeded by the receipts of mutton from New Zealand (1,525,000 cwt.), though in addition 505,400 cwt. were received from Australia.

The declared value of the sheep was 30s. 5d., or 7d. more than in the preceding year, while fresh mutton averaged 38s. 6d. per cwt., compared with 39s. 3d. in 1904.

TABLE I.

Imports of Live and Dead Meat.

Description.	Quantities.		Values.	
	1904.	1905.	1904.	1905.
	No.	No.	£	£
Cattle	549,532	565,139	9,736,436	9,665,806
Sheep	382,240	183,084	591,984	278,753
Swine	—	150	—	300
Total Live Animals...	—	—	10,328,420	9,944,859
	Cwt.	Cwt.		
Beef, Fresh	4,350,031	5,037,521	8,058,341	8,911,593
„ Salted	144,304	142,806	187,288	202,417
Mutton, Fresh	3,494,782	3,810,969	6,861,531	7,336,480
Pork, Fresh	610,485	505,633	1,378,467	1,162,370
„ Salted	243,842	205,965	294,080	252,606
Bacon	5,452,311	5,498,960	12,832,142	12,774,855
Hams	1,244,003	1,318,301	3,104,999	3,118,372
Meat, Unenumerated, Salted, or Fresh ...	631,012	670,144	1,164,442	1,225,692
Meat, Preserved ...	813,018	833,029	2,458,591	2,647,189
Rabbits (dead)... ...	533,698	656,078	780,737	835,929
Total Dead Meat ...	17,517,486	18,679,406	37,120,618	38,467,503

The next item of importance in the above table is bacon, the imports of which were more than in 1903 and 1904, though below those of the years 1898–1901. The increase

appears to be entirely due to a considerable expansion in the imports of Canadian bacon, viz., from 665,200 cwt. in 1903 and 829,900 cwt. in 1904 to 1,191,400 cwt. in 1905, the contributions from Denmark (1,471,700 cwt.) and from the United States (2,755,000 cwt.) being less than in the preceding year. A comparison of the average values shows a fall from 47s. 1d. per cwt. in 1904 to 46s. 6d. per cwt. in 1905, the average for Danish bacon being 54s. 1d., for American 42s. 4d., and for Canadian 46s. 2d. per cwt.

Converting the live animals into their equivalent weight of meat and adding the total imports of dead meat of all kinds, it appears that this country consumed, in addition to the home supply, some 22,457,600 cwt., compared with 21,321,000 cwt. in 1904. The total value credited to these different kinds of live and dead meat was £48,412,000.

TABLE II.

Imports of Dairy Produce, Margarine, and Eggs.

Description.	Quantities.		Values.	
	1904.	1905.	1904.	1905.
	Cwt.	Cwt.	£	£
Butter	4,241,005	4,147,864	21,117,162	21,585,622
Margarine	960,278	1,088,189	2,494,467	2,736,286
Cheese	2,554,297	2,442,660	5,843,770	6,339,742
Milk, Condensed ...	904,136	894,921	1,608,391	1,584,903
	Gt. Hundreds.			
Eggs	19,942,594	18,814,261	6,730,574	6,812,476

In point of quantity the imports of dairy produce and eggs shown in the above table were rather less in 1905, though the value was greater. The figures for butter do not exhibit any substantial change, the fluctuations in the supplies from the different countries being comparatively unimportant. Among Continental countries Sweden, Denmark, Holland, and France continued to show the tendency to decline, which was observable last year, while Russia showed an increase. Canadian butter exhibited a further growth. The average value of imported butter was higher in 1905 (£5 4s. 2d. per cwt.) than in 1904 (£4 19s. 7d. per cwt.).

Canada is the principal exporter of cheese to the United Kingdom, and out of a total import of 2,442,700 cwt. in 1905, 1,858,800 cwt. came from that country. In the previous year a fall in the average declared value had to be recorded, viz., from 52s. 4d. in 1903 to 45s. 9d. in 1904, but in 1905 there was a recovery to 51s. 11d. per cwt.

The principal feature of the egg import trade was a diminution in the numbers, accompanied by an increase in value. The receipts credited to Russia and Denmark were the largest ever recorded, while those attributed to Germany, Belgium, France, and Canada were smaller than for some years past. Russia is the principal source of supply to this country, and accounted for 7,622,400 great hundreds in 1905, as against 7,032,900 great hundreds in 1904. There was a very noticeable decline in the number of eggs coming through German ports. The average value was 7s. 2¼d. per great hundred, or 5¼d. more than in 1904.

TABLE III.

Imports of Horses, Poultry, and Miscellaneous Animal Products.

Description.	Quantities.		Values.	
	1904.	1905.	1904.	1905.
			£	£
Horses ... ... No.	18,491	13,711	457,828	354,030
Poultry and Game £	—	—	1,217,277	999,480
Lard ... ... cwt.	1,830,837	2,012,305	3,342,389	3,692,573
Tallow and Stearine ,,	1,758,074	1,821,919	2,249,445	2,368,026
Wool, Sheep, Lambs lb.	561,677,833	615,708,727	20,366,030	23,821,359
Sheepskins, undressed No.	15,081,834	17,531,076	1,577,411	1,936,273
Hides* ... ... cwt.	449,580	508,475	1,106,360	1,322,890

* Does not include dry hides.

The imports of horses showed a further decline in 1905, and touched a lower figure than in any year since 1893. The number has been steadily declining since 1900, when 51,786 were received.

The value of the poultry (alive or dead) received in 1905 was £906,400, compared with £1,089,100 in 1904; Russia takes an important share in this trade (£275,000), followed by France (£227,100), Belgium (£193,800), and the United States (£152,000). The imports of game are much less important than those of

poultry, and were valued at £93,100 in 1905 and at £128,100 in 1904.

The imports of sheep or lambs' wool steadily declined, from 1901 to 1904, but the past year saw a check to this diminution in quantity and a return to nearer the level of the year 1903. Many of the contributing countries show an increase, particularly Australia and Argentina, together with a decided rise in value. Out of the total of 615,709,000 lb., Australia sent 253,373,000 lb. compared with 220,483,000 lb. last year, and New Zealand sent 139,264,000 lb. as against 133,753,000 lb. in 1904. The receipts from France, Turkey, Russia, India, South Africa, and Argentina were all larger than in the two preceding years. In the case of the last-named country the imports were 26,675,000 lb., or much above the level of 1904 (13,367,000 lb.).

The re-exports of foreign wool increased compared with 1904, so that the balance of foreign wool remaining for manufacture in this country was only increased by 29,000,000 lb. The average value of the imports was $9\frac{1}{4}$d. per lb., as compared with $8\frac{3}{4}$d. in 1904, $8\frac{1}{4}$d. in 1903, and $7\frac{1}{2}$d. in 1902.

TABLE IV.

Imports of Grain and Flour.

Description.	Quantities.		Values.	
	1904.	1905.	1904.	1905.
	Cwt.	Cwt.	£	£
Wheat	97,782,500	97,622,752	34,266,416	35,279,928
Wheat Meal and Flour	14,722,893	11,954,763	7,258,600	6,044,745
Barley	27,152,300	21,426,900	7,161,600	6,017,350
Oats	14,097,700	17,095,463	3,726,120	4,713,265
Oatmeal	648,770	633,199	456,593	463,293
Maize	42,897,880	42,101,210	10,247,134	11,034,748
Maize Meal	316,660	459,188	100,940	144,829
Peas	2,179,506	2,015,876	767,097	724,757
Beans	1,862,686	1,225,050	577,094	414,227
Other Corn and Meal ...	1,660,434	1,712,487	513,894	581,468
Total	—	—	65,075,488	65,418,610

The above table gives the imports of grain and flour. Broadly, it shows that there was a slight decrease in the supply of foreign wheat, together with a decided diminution in foreign flour; barley, peas, beans, and maize were also imported in smaller

quantities, but oats seem to have been in more demand. The total value credited to the imports of the foreign grain shown in the table amounts, it will be seen, to £65,419,000.

During the past twelve months the leading sources of our wheat supply have been Russia (24,703,200 cwt.), Argentina (23,236,400 cwt.), India (22,807,400 cwt.), Australasia (10,404,600 cwt.), Canada (6,522,000 cwt.), and the United States (6,634,700 cwt.). For the past two years India, Russia, and Argentina have contended for the first place in this trade, the United States, whence our supplies in former years had chiefly been received, occupying a comparatively minor position. The decline in the importation of American flour, which has been another feature of this trade, continued during the past year, only 5,685,400 cwt. being received, compared with 8,252,600 cwt. in 1904 and 16,223,600 cwt. in 1903. The quantity of wheat flour imported was less than in any year since 1881, the diminu-

TABLE V.

Miscellaneous Imports.

Description.	Quantities.		Values.	
	1904.	1905.	1904.	1905.
			£	£
Onions ... ... bush.	8,292,136	7,585,951	1,076,472	1,094,693
Potatoes... ... cwt.	9,993,965	3,664,294	2,437,971	1,404,607
Tomatoes ... ,,	1,134,721	1,137,193	1,007,274	970,579
Vegetables, unenumerated	—	—	457,491	419,752
	Cwt.	Cwt.		
Apples	3,771,781	3,494,650	2,118,294	2,065,193
Pears	535,614	417,654	503,573	407,679
Plums	493,984	480,291	537,485	524,673
Cherries...	260,724	186,682	319,824	253,042
Strawberries	34,524	29,399	49,536	40,120
Currants	116,888	82,438	143,983	94,590
Gooseberries	36,215	17,159	21,024	11,941
Hops	313,667	108,953	1,839,854	456,280
Flax	1,498,340	1,801,960	3,185,475	3,581,808
Clover and Grass Seeds	426,475	316,111	869,838	651,712
Wood and Timber (except Furniture Woods, Hardwoods, and	Loads.	Loads.		
Veneers)	9,305,844	8,964,143	21,592,784	21,285,165
Oilseeds—Cotton tons	468,653	568,928	2,537,499	2,973,250
,, Flax or Linseed qrs.	2,785,983	1,923,940	4,502,064	3,541,163
,, Rape ,,	309,325	178,098	386,420	280,290
Oilseed Cake ... tons	371,809	357,577	2,128,817	2,206,290
Manures... ... ,,	599,175	602,031	2,067,400	2,069,637
Flowers, fresh	—	—	242,454	202,217

tion from the United States being accompanied by smaller receipts from Canada, France, and Hungary. The average declared value of wheat was 7s. 3d. per cwt., and of flour 10s. 1d. per cwt.

Barley seems to have been received in smaller quantities than in 1904 from all the contributing countries, but the imports of oats, particularly Russian oats, increased. Taking these two grains together, Russia, in the preceding year, contributed 46 per cent. of the total supply, a proportion which was increased to 55 per cent. in the year under review.

Maize, our most important feeding stuff, was received in approximately similar quantities to the preceding year, but although the Argentine Republic sent us in 1905 the largest contribution (18,954,600 cwt.) to the total, it was closely followed by the United States (18,310,000 cwt.). Owing to the bad harvest of 1904, no maize was received from Roumania in 1905—the exportation being entirely prohibited until November last. The receipts from Russia during the year were insignificant.

The average value of these grains during the past two years have been as follows :—Barley, 5s. 7d. per cwt. in 1905 and 5s. 3d. per cwt. in 1904; oats, 5s. 6d. per cwt. in 1905 and 5s. 3d. per cwt. in 1904; maize, 5s. 3d. per cwt. in 1905 and 4s. 9d. per cwt. in 1904.

The decline in the imports of potatoes is one of the features of Table V. Germany sent practically nothing, while the receipts from France diminished from 4,157,700 cwt. in 1904 to 1,937,300 cwt. in 1905.

The imports of all the various kinds of fruit enumerated above were on a smaller scale than in 1904, and the receipts of hops were also much less. Our purchases of wood, both hewn and sawn, were also less important than for several years past.

Mushroom Spawn Making.

Experience has shown mushroom-growers that it is unprofitable to take growing spawn continually from one bed for the propagation of the next crop. Little is known as to the causes which lead the spawn to lose its power of vigorous mushroom production in two or three years, but for practical

purposes it is necessary to renew the spawn by obtaining material known as virgin spawn which has not previously weakened itself by the production of mushrooms. Natural virgin spawn may be found wherever it has been possible for the spores to germinate and produce a mycelium naturally. Ordinarily, such spawn appears in compost heaps, rich garden beds, pastures, &c. Many attempts have been made by practical growers to develop spawn from spores, sowing the gill portions of mature mushrooms in specially constructed beds, but the results, so far as is known, have not been satisfactory. As a rule, therefore, growers rely upon virgin spawn obtained, as it were, by chance. Where a spontaneous growth of spawn is observed trenches are dug, and these filled with good stable manure, which in time becomes penetrated, or the virgin spawn may be used in spawning the brick or cake in which it is sold.

This method, it will be seen, prevents much progress being made in the selection of desirable varieties of mushrooms or in the improvement of varieties; but recently, as the result of investigations carried out by Professor B. M. Duggar on behalf of the United States Department of Agriculture,* a method of making "tissue cultures" has been discovered, which admits of cultures being made of any desirable species or varieties. The use of this new method has, it is stated, been the means of advancing the industry of spawn making in the United States during the past two years. It is pointed out, however, that the pure culture method of making virgin spawn is not one which will prove successful in the hands of wholly inexperienced persons or of those unwilling to spend time and use the utmost care in the manipulation of the cultures and the culture material. The method described by Professor Duggar is summarised below.

In making pure cultures of mushrooms large test tubes or wide-mouthed bottles may be used; these should be carefully cleaned and, if possible, should be sterilised by dry heat as a preliminary precaution. For this purpose the tubes should be plugged with cotton, placed in a dry oven, and heated to a temperature of about 150 deg. C. for nearly an hour. Ordinarily, however, in rough work it is not essential to employ this preliminary sterilisation. In either case the tubes are next

* "Bureau of Plant Industry," Bull, No. 85.

partially filled (about two-thirds) with the manure or half-decayed leaves upon which it is desired to grow the virgin spawn. A plug is inserted in each tube, and the tubes are then sterilised in a steam boiler or under pressure. If sterilised under steam pressure, as in an autoclave, it is necessary to use about fifteen pounds pressure and to allow the tubes to remain at this pressure for from fifteen minutes to half an hour. If the sterilisation must be effected in a boiler or open water bath, it is desirable to boil the tubes for at least one hour on each of two or three successive days.

With the tubes thoroughly sterile, the next step is to make the cultures or inoculations. By the tissue-culture method the inoculations are made from pieces of the tissue of a living mushroom, and it is at this stage that selection may be made. One should procure from a bed of mushrooms in full bearing a mushroom which represents the most desirable qualities that are to be found. Size, quality, and general prolificness must all be considered. Having found the mushroom which it is desired to propagate, plants as young as possible may be used, and those which show the veil still intact are specially desirable. With a scalpel, or a pair of forceps, first sterilised by passing through a gas flame, small pieces of the internal tissue may be removed, and these pieces transferred to the tubes. It is well to wash the mushroom first, and the plant may then be broken open longitudinally and bits of the internal tissue readily removed without fear of contamination. Immediately upon inoculation the cotton plug is replaced in the tube, and after all the tubes are inoculated they should be put out of the dust, preferably in a situation where the temperature is about that of an ordinary living-room. In the course of several days a slight growth may be evident from the tissue if the conditions have been perfectly sterile. In the course of a week or more the growth should become very evident, and in three weeks the mouldlike development of mycelium should spread to practically all parts of the medium in the tube.

When the tubes are thoroughly "run" the contents may be removed and used in spawning brick. The contents of a single tube may spawn several bricks when carefully employed. If no transfers of the growing mycelium are made from one lot of

tubes to another, this first lot of bricks may be used later in spawning others. No further transfers, however, should be made from these bricks to others under any circumstances. Such a continuous transference is injurious to the vigour of the spawn and diminishes the quantity of mushrooms produced.

The materials entering into the composition of the brick are fermented stable manure, cow manure, and sometimes a small quantity of well-selected loam. In the horse manure the mycelium grows most readily. The cow manure binds the materials together into a compact form. The loam, which is, perhaps, least essential, is supposed to prevent cracking or hardening of the surface. If fresh manure is used, the necessity of using loam is, perhaps, to be emphasised.

In experiments made under the auspices of the Department of Agriculture, excellent results have been obtained by using a mixture of from two-thirds to three-fourths stable manure and the remainder cow manure. In this case the compost should be subjected to fermentation previous to use. When loam is employed, it may be used in more or less equal proportion to the cow manure, and the quantity of stable manure should be about equal to the other two ingredients.

The dry bricks ordinarily measure about $5\frac{1}{2}$ by $8\frac{1}{4}$ by $1\frac{1}{2}$ in. They should be made of somewhat larger size, say 6 by 9 by 2 in., to allow for shrinkage. The mould consists merely of an oak frame of four pieces strongly rivetted together. The compost may be made thoroughly wet; then, with the mould on a board of suitable width, the manure is compressed into it, and the mould removed from the brick then formed. The bricks must be left to dry for a few days on the board and then turned on edge for further drying.

A common method in spawning is to insert into the brick near both ends a piece of the virgin spawn. A cut is made with the knife and the spawn inserted, a stroke of the knife effectively closing the surface. This must be done as soon as the brick can be readily handled. The most favourable conditions for the growth of the spawn are practically the same as for mushroom growing. A fairly moist atmosphere, maintained if necessary by spraying, and a more or less uniform temperature (55 deg. to 60 deg. F.) are to be preferred. The size

of the piles of bricks will depend on the other conditions, but if there is any danger of considerable fermentative activity the bricks should be so disposed as to permit perfect ventilation between two or more adjacent rows.

When the bricks are thoroughly "run" they should be dried under cover, since in a moist brick the spawn would continue to grow and would soon produce small mushrooms or else become mouldy.

In conclusion, Professor Duggar observes that it is not to be supposed that the method will enable all mushroom-growers to manufacture their own spawn with comparative ease, but there is no reason why the manufacture of mushroom spawn in the manner indicated should not become a specialised industry.

Heart Rot of Beet, Mangold and Swede.*

This disease (*Sphaerella tabifica*) is not uncommon in France, where it often causes considerable damage to sugar beet. In this country it has of late years been frequently reported on mangold and swedes. An instance occurred recently where nearly every root grown on a four-acre plot of "Yellow Globe" mangold was badly diseased. At the time of its discovery workmen were busily engaged in cutting off the sound portions for cattle food, and chopping up the diseased parts and scattering them over the land to be ploughed in. The disease rarely appears before the middle of August, and first attacks the stalks of the largest leaves. Its presence is indicated by the wilting of the leaves, such as follows a hot, dry day; diseased leaves, however, do not recover their erect position during the night, but remain lying on the ground, turn yellow, and decay. This is due to the fungus growing in the leaf-stalk having choked the vessels and thus prevented the passage of water into the leaf. When the leaf is dying, whitish patches of variable form and size, bounded by a dark line, and studded with minute black spots, the fruit of the fungus, appear on the leaf-stalk. Similar patches are also sometimes present on the leaves. Later in the season, when the leaf-stalks are dead

* *Journal*, November, 1904, p. 488.

and dry, a second form of fungus fruit appears on the bleached patches.

Some time after the leaves have been infected the mycelium of the fungus passes into the crown of the root and thence gradually extends downwards, its progress being clearly indi-

YELLOW GLOBE MANGOLD, SHOWING HEART ROT.

cated by a darkening of the tissues. Finally the entire root is reduced to a blackish, decayed mass.

If a portion of a diseased root, which is crowded with the mycelium of the fungus, is kept until the following season, it undergoes no change until about midsummer, when its surface

becomes covered with the fruit of the fungus. Such fruit furnishes the spores that infect a crop in the first instance.

When diseased roots are left on the land the same thing happens. If the disease appears, as indicated by the symptoms described, it is best to lift the crop at once before the fungus passes from the leaves to the root.

Diseased leaves and roots should be gathered and burned or deeply buried, and not thrown on the manure heap nor left on the land.

Yellow varieties of mangold are more susceptible to the disease than red ones, as proved by infection experiments.

New Process for the Manufacture of Nitrate of Lime.

The Board have received through the Foreign Office a dispatch from the British Consul-General at Christiania (Mr. Edward F. Gray), stating that a Norwegian company has been formed there, under the name of "Norsk hydro-elektrisk Kraelstofaktieselskab," to develop the Norwegian patents of Professor Birkeland, of the University of Christiania, and Mr. S. Eyde, a Norwegian civil engineer, for the production of nitrogen through the oxydisation of air by means of their hydro-electric process, and for the manufacture of nitrate of lime for agricultural and other purposes.

According to the terms of the company's prospectus, the capital amounts to £388,920, of which £222,240 is in 8 per cent. preference shares, and the rest in ordinary shares. The Banque de Paris et des Pays Bas is understood to be largely interested in the undertaking, as well as Swedish capital.

The company has secured water-power of about 29,000 horse-power at the Svaelgfos waterfall, near Notodden, where the present saltpetre factory is situated, as well as the right to purchase other falls, including the well-known Rjukanfos of about 220,000 horse-power. The inventors claim for their process greater efficiency and economy than can be obtained by the more complicated system of Lovejoy and Bradley at Niagara, and also superiority over other known processes for the fixation of nitrogen from the air, such as that of the

Deutscher Cyanid Aktiengesellschaft,* and others. Should the company prove successful, it seems that an industry of considerable importance will thereby be created in Norway.

The following is a brief description of the Birkeland-Eyde method, which is now in use in Norway for the manufacture of nitrate of lime from air by a hydro-electric process.

One of the main features in the process is a new kind of electric furnace in which is produced a special flame which Professor Birkeland claims to have discovered while engaged in the solution of another problem. Together with Mr. Eyde he has applied the flame to obtain a chemical combination of oxygen and nitrogen. In Professor Birkeland's experiment, the electrodes were placed equatorially between the poles of a powerful electro-magnet, with a fixed distance between the points of the electrodes of from one to two millimetres. A steady flame was created, causing a loud noise, and running through four octaves according to the strength of the electro-magnet.

Amongst the chemical reactions which can be caused by the flame is the oxydisation of the nitrogen of the air.

Without going into the details of the construction of the furnaces, it may be stated that it is claimed that the flame is comparatively steady, and up to 1,000 horse-power can safely be carried on two 1·5 centimetre water-cooled tubes of copper which form the electrodes, thus producing a flame 1·8 metres in diameter; and, further, that these flames can burn continually without causing damage in a flat-shaped furnace about eight centimetres wide and two metres long. Experiments in manufacture have passed through various stages, ending with an experimental station near Arendal, with 500 to 1,000 horse-power, and absorption towers of granite, each measuring forty cubic metres.

On the 2nd May, 1905, the first nitrate factory was opened at Notodden. The factory contains three furnaces, each of 700 horse-power. These furnaces are stated to show great stability and regularity, and treat some 75,000 litres of air per minute, through which the flame is passed, producing a dark brown substance named peroxyde of nitrogen. The gases are absorbed and transformed into nitric acid in two rows of stone towers,

* See article on "Lime Nitrogen," *Journal*, May, 1905, p. 101.

four in each row, each tower measuring forty cubic metres. In each row is a fifth tower in which the remaining gases are absorbed into lime water. It is claimed that about 95 per cent. of the nitrous gases can be absorbed. The nitrate of lime produced is said to resemble salt, and to be easily dissolved in water, and a method has been found of transforming it into a basic salt which keeps dry, and which can be distributed in a granular form by means of agricultural sowing machines.

Experiments in the manurial properties of the Norwegian nitrate of lime compared with other products have been made at the Norwegian State Agricultural College, and it is claimed that it is equal to natural saltpetre in its results, and, indeed, superior on sandy soil on account of its chalky properties. It is also thought it may be employed in connection with the manufacture of explosives and various colours.

Germany is said to take the product as fast as it can be supplied, but no doubt samples could be had on making application to the company (" Norsk hydro-elektrisk Kraelstofaktieselskab ") who have taken over the manufacture. It would be useful if agricultural colleges and experimental stations in this country would obtain supplies of this material for experimental purposes.

Comparative Value of Oil Cake and Artificial Manures.

Cakes and other feeding stuffs are often bought by farmers when both their stock and their land could be equally improved by cheaper means. The so-called " Manuring for Mutton " experiments* which have been carried out during the past nine years have proved conclusively that artificial manures, costing less than a pound per acre, may often so improve the quality of the herbage that sheep will lay on more mutton than similar animals grazing similar unmanured land alongside, though the latter animals may be getting as much of the richest cake as they will eat. What holds good with regard to sheep is doubtless also true with regard to cattle.

As regards the manurial value of cake consumed by stock, it

* See *Journal*, Vol. V., p. 300, Dec., 1898; Vol. VI., p. 293, Dec., 1899; Vol. VII, p. 311, Dec., 1900.

must be remembered that this is, in many cases, much less than would in theory be expected. In the first place, the value of the manure made from cake depends, as in the case of artificial manures, on the presence of the three ingredients: nitrogen, phosphoric acid, and potash. But in using artificial manures, one only of these substances or any two of them can be applied in any desired proportion, whereas in cake residues they cannot be thus separated and dealt with. It is, however, a fundamental principle in manuring that the composition of the manure should be regulated by (*a*) the deficiencies of the soil, or (*b*) the particular requirements of the crop. There are wide areas of pasture in this country which not only require no nitrogen or no potash, but which are actually rendered less valuable by receiving these substances. In cases where a soil contains abundance of nitrogen, or where a plant can draw its nitrogen from the air, it is wasteful to supply this element in the manure, as is unavoidable in the case of cake residues containing all three manurial constituents.

In cake residues, moreover, very great waste takes place in the farmyard manure itself. Lawes and Gilbert put this loss at 50 per cent., and this view has been endorsed by Voelcker and Hall. Thus, although the manurial elements of a ton of linseed cake are theoretically worth £2 11s. 11d. as the residues leave the animal, they are worth very much less by the time the farmyard manure is carried to the land and offered to the crop. Not only is there this loss of manurial value in cake residues before the farmyard manure that contains them reaches the land, but probably no more than one-half of the nitrogen that is left is taken up by the crop to which it is applied.

Supply of Linseed Cake in the United Kingdom.

The imports of flax or linseed into the United Kingdom have during recent years shown a considerable tendency to increase, largely in consequence of the development of the cultivation of linseed in Argentina and the increased exports therefrom to this country. In the year just ended, however, the quantities were below the level of 1903 and 1904. During the past six years the totals have been as follows :—

Year.	Quantity.	Value.
	Qrs.	£
1900	1,666,000	4,162,000
1901	1,685,000	4,264,000
1902	1,819,000	4,487,000
1903	2,186,000	4,180,000
1904	2,786,000	4,502 000
1905	1,924,000	3,541,000

The seed is used for the extraction of linseed oil, and the residue is made into linseed cake for cattle feeding. Argentina and India are now the principal sources of supply, and taking the average of the five years, 1901–1905, out of an annual import of 2,080,000 qrs., 775,000 qrs., or 37 per cent. came from India, and 982,000 qrs., or 47 per cent. from Argentina, the only other contributor of importance being Russia, which supplied 240,000 qrs. It will be seen from the figures given above that there has been a distinct fall in values, the average declared value in 1901 being 50s. 7d. per qr., and in 1905 only 36s. 9d. per qr. The re-exports during the five years (1901–1905) averaged 123,000 qrs., so that the quantity remaining for home consumption was about 1,957,000 qrs.

In the *United States Crop Reporter* for December last it is stated that the average yield of oil from Russian seed is estimated at about 27 per cent., from Calcutta seed about 32½ per cent., from Bombay seed 33½ per cent., and from Argentine seed about 31½ per cent. The mechanical process of expressing oil from flaxseed in the United Kingdom is thus described. The seed, after having been crushed into fine meal by being passed between the contiguous surfaces of a stack of steel rollers, is moderately heated in steam-jacketed heaters. The oil is then expressed by pressure in a powerful hydraulic press. There is no waste in the process of manufacture, a given weight of seed yielding an approximately equivalent weight of oil and oilcake. Of the two products the oil is, weight for weight, much the higher-priced substance, and, consequently, is the chief object of the manufacturing process. By no system of pressure, however, can all the oil content be expressed from the crushed meal. A small proportion always remains in the residue, the oilcake, and it is an important fact that both the economic and the cash value of the latter product is to a considerable extent dependent upon the oil it contains. In the United Kingdom the demand of

cattle feeders inclines to oilcake which, the protein content being satisfactory, contains the highest per cent. of fat or oil. Crushers recognise this requirement of the extensive home market, and it is on this account that British-made cake commands a higher price than American-made cake upon the British markets. As a general rule, therefore, the yield of oil obtained by British crushers from a given quantity of flaxseed is somewhat smaller than would be obtained from the same quantity of seed in the United States, and, consequently, British-made oilcake usually contains a higher percentage of fat than that imported from America.

The average yield of oil per bushel (56 lb.) of seed is estimated in the same publication to be equivalent to 18 lb. (2·4 gallons), leaving a residue of 38 lb. in the form of oilcake. On this assumption the quantity of oilcake manufactured from flaxseed imported for crushing in the United Kingdom during the past five years has averaged 285,000 tons.

Practically the whole of this is retained for home consumption, and in addition there is a fairly steady importation of linseed cake from abroad, averaging in the same period (1901–1905) 171,000 tons annually. In 1905 it was lower than in any of the five preceding years, and only amounted to 154,762 tons. Germany, Russia, and the United States are the principal sources of supply. The exports of home-made linseed cake are only available for 1904 and 1905, when they amounted to 101 and 546 tons, while the re-exports of imported linseed cake which are available for the five-year period 1900-4 averaged 443 tons. From this it will be seen that nearly the whole of the supply is consumed in the United Kingdom. Adding the estimated home production to the imports and deducting the exports, it appears that the supply has averaged 455,000 tons annually in the quinquennium 1901–1905, of which about 62 per cent. has been manufactured at home, and the remainder imported.

Exportation of Live Stock to France.

The Board of Agriculture and Fisheries have been informed that difficulties have arisen at some of the French Channel ports owing to the fact that the formalities prescribed by the Decree of the 11th June, 1905, with regard to the importation into France of horses and other animals have not been complied with in Great Britain.

The Board desire, therefore, to bring to the notice of all persons exporting horses, asses, cattle, sheep, goats, and pigs to France, that the landing can only take place through certain specified Customs Houses; and that the stock must be accompanied by a certificate of origin from the administrative authority of the place from which they come, certifying that no contagious disease affecting animals of the species in question exists or has existed in that place during the preceding six weeks. A summary of the regulations was given in the *Journal*, August, 1905.

Live Stock Import Regulations—Queensland.*

According to the regulations issued under the "Diseases in Stock Act of 1896" live stock may be imported into Queensland from Great Britain under the following conditions:—

The owner of the stock shall, on arrival, give to the inspector at the port at least twenty-four hours' notice of his desire to land stock. He shall also deliver to the inspector (1) a declaration that the stock are entirely free from disease, the declaration being countersigned by the master of the vessel, and by the attendant (if any) upon the stock during the voyage; this declaration must be made before a Justice of the Peace; and (2) a certificate issued by a duly qualified veterinary surgeon at the port of shipment to the effect that the stock were entirely free from disease when they were shipped.

All such stock are to be forthwith examined by a duly authorised inspector and veterinary surgeon, and if the stock are found to be infected they may be ordered to be destroyed, or dressed, inoculated, or otherwise treated as the Chief Inspector directs. All such stock as are free from infection shall, if the inspector so directs, be first disinfected and cleansed to his satisfaction, and shall then be landed and removed to quarantine. No imported stock shall be transhipped in any port in Queensland except by the written permission of an inspector.

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* Live stock import regulations have been published in this *Journal* for the following countries: Transvaal, March, 1903; United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, August, 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; and Spain, Dec., 1905.

Quarantine.—All stock subject to quarantine, shall be removed to and remain in quarantine at the risk and expense of the owner, and while in quarantine shall be disinfected, cleansed, inoculated, dipped, dressed, or treated under the supervision of an inspector, as prescribed by the regulations, or as the Chief Inspector directs.

Horses imported into Queensland from Great Britain may, after their arrival and before they are released from quarantine, be subjected to the mallein test for glanders, if in the opinion of the Chief Inspector of Stock such test is necessary, notwithstanding that they may have been tested immediately before leaving the place of shipment. The term of quarantine is fourteen days, but in the case of such horses as are found by the mallein test to be free from glanders and farcy this is to be dispensed with.

Cattle may, after their arrival and before they are released from quarantine, be subjected to the tuberculin test for tuberculosis if in the opinion of the Chief Inspector of Stock such test is necessary, notwithstanding that they may have been tested immediately before leaving the place of shipment. The term of quarantine is forty days.

Sheep shall, while in quarantine, be dressed or dipped, the period of quarantine being thirty days.

Swine must undergo a quarantine of forty days.

The period of quarantine shall date from the day of landing, and stock will only be released from quarantine upon the order of the Minister.

Breeding Stock in the Transvaal.

Notice has been issued by the Director of Agriculture for the Transvaal* that, with the object of encouraging the importation of breeding stock into the Transvaal Colony, the Government is prepared to give assistance to *boná-fide* farmers by grants not exceeding £20 to any individual. Such grants will be applied towards defraying half the cost of transport by rail from any station in South Africa to any station in the Transvaal on sheep and Angora goats imported solely

* *Transvaal Agricultural Journal*, Oct., 1905, p. 268.

for breeding purposes. In the present financial year the amount of these grants is limited to the sum of £2,000. Notes as to the importation of live stock into the Transvaal appeared in this *Journal*, April, 1904, p. 41, and June, 1905, p. 166.

Live Stock in the German Empire.

The farm live stock of the German Empire are not enumerated annually, but a special inquiry is held from time to time as may be thought necessary. Five of these censuses have been held during the past thirty years, viz., in 1873, 1883, 1892, 1900, and 1904. The results of the last, which was taken on 1st December, 1904, have recently been issued, and may be compared with the figures for 1873:—

Live Stock.	In Thousands.		Percentage of Increase or Decrease.
	1873.	1904.	
Horses	3,352	4,267	+ 27·30
Cattle	15,777	19,332	+ 22·53
Sheep	24,999	7,907	− 68·37
Pigs	7,124	18,921	+165·59

The changes in the live stock industry which are reflected by this table are very striking. It will be seen that the extension in cattle-breeding has been substantial, and probably more than counterbalances the decline in sheep-breeding; in addition, pigs are now two and a-half times as numerous as they were thirty years ago.

Testing of Farmers' Milk.

In connection with the arrangements which have been made by most of the agricultural colleges for determining the percentage of butter-fat in farmers' milk for a fee of sixpence per sample (Leaflet No. 146), the Board think it may be useful to point out that the services rendered for this small fee are by no means identical with the exact chemical analysis made by a public analyst. There is, indeed, an essential difference between the rapid mechanical tests carried out by the agricultural colleges for the purpose of enabling farmers to effect an improvement in

the economical management of their dairies and the important and accurate analyses required of public analysts, with the object very often of furnishing evidence on which to base a prosecution under the Sale of Food and Drugs Acts.

In the first case, the tests are made at the request of the farmer and for his private information only. The test applied is that known as the Gerber test, which merely calls for care and a certain amount of skill in working, but does not necessitate any scientific training. To be of value the tests should be taken regularly and continuously, so that each test becomes one of a series which, by indicating the variations in the quality of his milk as regards the content of butter-fat, will enable the farmer to trace the variations to such causes as the influence of weather, the interval between milking, the food supply, housing and treatment of the cows, and to discover under what conditions the best supply of milk is obtained, which cows are the most profitable, and, generally speaking, how his business may be conducted to the best advantage.

For this purpose it is not necessary that the tests should be of the nature of an exact analysis, and, so long as the result is sufficient to enable the farmer to determine his position as above indicated, nothing more is required.

On the other hand, analyses conducted by public analysts at the request of local authorities must necessarily be carried out in the most scientific and skilful manner, in order to ascertain with the utmost degree of exactness the character of the material analysed, and where so much depends upon the result of the analysis it would not be possible to adopt a rapid mechanical method such as the Gerber test.

With the view of securing uniformity in dealing with samples, the Board have prepared two forms of report for the use of farmers when sending samples to the various institutions—one for use when a sample of a single milking of a single cow is sent, and one for use when a sample of the mixed milk of a herd is sent. These forms are to be filled up with the necessary particulars as to the cow or cows from which the sample was taken and forwarded to the institute with the sample. The form will be returned to the sender with a report as to the percentage of fat contained in the sample as ascertained by the Gerber test.

Milk Testing Societies in Sweden.

The system of co-operative milk testing by what are known as "Control Societies," which has been found so successful in Denmark* is reported to have been making rapid strides in Sweden in the last few years. In 1904 there were over 200 of these societies in existence, of which some eighty-two were in the district of Malmo. The method adopted by these societies is to employ a young man possessing the necessary experience in milk testing to visit each of the dairies belonging to the society once a fortnight and test the milk of each, and enter up particulars of the yield &c., in books kept for the purpose. The societies are usually federated in a central organisation with the object of securing uniformity of procedure and comparing results.

From a report† of the proceedings of the Malmo Union it appears that the increase in the milk yield of cows belonging to members of the federated societies during four years has been as follows:—

Year.	No. of Members.	Average No. of Cows.	Average Yield per Cow.		
			Milk.	Butter-Fat.	Per Cent. of Fat.
			Lb.	Lb.	
1901-2	227	10,960	3,134	101	3·21
1902-3	311	16,207	3,424	111	3·25
1903-4	626	22,337	3,484	113	3·25
1904-5	860	27,362	3,539	115	3·24

Whilst the average yield of milk per cow has increased from 3,134 lb. to 3,539 lb., the average consumption of fodder has decreased, so that the production of milk per 100 "feeding units" has increased from 135 lb. to 155 lb. The method of calculating the food supplied to cows in "feeding units" is based on the assumption that varying quantities of feeding-stuffs are equal to one another or to one "feeding unit," and by recording the food given to the cows the quantities can be reduced to feeding units so as to enable the consumption of different cows, or of cows on different farms, to be compared

* *Journal*, April, 1905, p. 21.
† Mitt. Deut. Landw. Gesell, No. 42, 1905.

with regard to their yield of milk. The Malmo Union have adopted a calculation which differs from that employed in Denmark, each of the following being regarded as equal to one feeding unit:—1·2 lb. molasses; 1·1 lb. wheat or rye bran; 1·0 lb. palm-seed cake, malt sprouts; ·9 lb. rape, sunflower-seed, linseed or sesame-seed cake; ·8 lb. cotton-seed or earth nut cake.

The Danish method does not attempt to distinguish between the various concentrated foods, which are all treated as equal, a method which is considered sufficiently exact for practical purposes.

The increase in the average milk production which normally follows the adoption of this practice of systematic milk testing is to be attributed to the knowledge of the productive capabilities of each cow, which enables the farmer to weed out unsatisfactory animals and to breed from the best.

Even in the case of a large number of cows, as in the table above, the increase amounted to 13 per cent. in four years, and the records of individual societies frequently show a much greater improvement than this. Thus the Valläkra Society increased its average yield per cow in six years from 6,703 lb. to 8,767 lb., or by 31 per cent., while the fat content increased from 3·09 to 3·21 per cent.

Queensland Dairy Legislation.

The Dairy Produce Act of 1904 which is now in force in Queensland provides for the registration of dairies, factories, and milk shops, and the inspection of these premises, of the cattle, and of the *personnel* as regards any disease likely to contaminate dairy produce.

The Act defines pure milk as the whole of the milk, including the strippings, drawn at the time of milking. The term does not include milk which contains less than 3 per cent. of butter-fat or less than 8·5 per cent. of solids other than butter-fat, or which is mixed with any preservative or chemical or colouring matter of any kind whatsoever. Separated and condensed milk can only be sold on certain conditions, and there are limits for water and fat in butter, viz., 16 per cent. and 80

per cent. respectively. No preservative may be added to butter other than boric acid, or a mixture of boric acid and borax, of a quantity not exceeding 0·5 per cent., or 35 grains per pound expressed as boric acid. The use of formaldehyde, formalin, salicylic acid, or other preservative is absolutely prohibited.

Regulations issued on the 30th March last require that the separator bowl and all parts of the separator which come in contact with milk must be thoroughly cleansed on each occasion immediately after the process of separating, first by immersion in cold water, and then by steam or hot water, and all dairy utensils must be promptly cleansed in like manner. No earth closet or other sanitary convenience may be placed within 50 ft. of any separator-room, or room used for the storage of dairy produce. Every cowshed must be kept clean, and the droppings of cows must be gathered and removed to a manure heap after each milking. At the time of milking the udders and teats must be well cleansed, and the hands of the person employed in milking must be thoroughly clean.

It is not lawful to export beyond the Commonwealth any dairy produce, the produce of the State, until the same has been inspected, graded, and marked, and no butter may be shipped at a higher temperature than 40 deg. F. It is graded according to quality on the following scale of points :—For butter : Flavour, 50 ; body, moisture, and texture, 20 ; colour, 10 ; salting, 10 ; finish, 10. For cheese : Flavour, 50 ; body and texture, 30 ; colour, 15 ; finish, 5. There are three classes or grades, indicated respectively as "Approved for Export No. 1," "Approved for Export," and "Not Approved," and the packages are marked accordingly by means of distinctive brands. When butter or cheese has been inspected and graded the inspector supplies to the maker a certificate showing the grade, the points awarded, and the result of the chemical analysis, &c., and to the shipper a schedule containing a facsimile of the grading inspector's stamp. Heavy penalties exist against fraudulent use of, or interference with, the brands. Recent additional regulations provide for marking butter or cheese intended for export to another Australian State, and for cancelling brands on boxes which were originally intended for exportation beyond the Commonwealth.

Butter Regulations in Argentina.

The dairying industry is gradually being developed in the Argentine Republic, and a considerable quantity of butter is now sent from that country to the United Kingdom and to South Africa. In 1902 the export amounted to 4,103 tons, and in 1904 to 5,294 tons.

Regulations have recently been made for the inspection of the manufacture of butter. According to a Decree, dated 18th November, 1905, of which a translation has been furnished by Mr. F. D. Harford, Secretary of the British Legation, butter factories which desire to have an official guarantee of the purity of their products must permit the free entry of official inspectors at any time in order that (1) they may take samples, (2) that they may ascertain that no margarine exists on the premises, and (3) that they may inspect the factories from a hygienic point of view. Samples may also be taken at the time of exportation.

The inspectors are to place on the wrappers, or on the product itself of the factories under inspection, a stamp on the outside of the wrapper or a label of perforated parchment paper guaranteeing the purity of the contents, provided that the butter intended for export complies with the following conditions :—(*a*) That it contains 82 per cent. of fat derived from milk, and not more than 16 per cent. of water, and no chloride of sodium ; (*b*) that it has been carefully made, and is not in a rancid or musty condition ; (*c*) that it contains neither colouring nor antiseptic matter dangerous to health. The employment of any substance allowed in the country to which it is exported will be allowed.

In the event of margarine being found on the premises of a factory under control, or in the event of butter made therein proving to be adulterated, the control will be withdrawn.

The Production of Brown or Tinted Eggs.

A point which poultry-keepers would do well to bear in mind is that for marketing purposes, brown or tinted eggs are usually more valuable than white ones. In some of the home markets the highest prices are obtained for eggs which have a tinted shell, and the best class of traders find that these eggs are constantly enquired for by their customers. In spite of the

fact, which is perhaps generally acknowledged, that the colour of the shell does not affect the quality of the egg, the preference indicated above exists, and must be taken into account. It is therefore desirable to note which breeds produce eggs which will meet the requirements.

The breeds which produce tinted eggs are without exception sitters ; and of the breeds which are commonly kept the following list includes those which yield eggs of the desired character :—Langshans, Cochins, Plymouth Rocks, Orpingtons, Game, Wyandottes, Brahmas, Faverolles, Coucous de Malines. In addition there are other breeds which are not kept for egg production, notably the Indian Game and the Malay. Of the varieties named the Langshan produces the most beautifully tinted egg, and this perhaps explains why that variety at one time attained such popularity.

Unfortunately, some of the breeds mentioned lay eggs which are small in size, but in this connection it must be borne in mind that small eggs may be more acceptable to the consumer if tinted than are larger white eggs. Crosses are frequently made with a view of increasing the prolificacy, and at the same time securing larger size generally. This results in the shells being less highly tinted than would otherwise be the case.

In crossing two breeds producing respectively white and tinted eggs, it is necessary to depend chiefly upon the females for conservation of the tinted characteristic, and it is advisable that in such crossing the male only should be selected from the white egg-producing races. The following crosses can be recommended both for the colour of the shell and the number of eggs so produced :—(1) White Leghorn—Langshan ; (2) Ancona—Langshan ; (3) Minorca—Langshan. These are given in order of merit. If the colour and size of the egg only be regarded, the last-named cross would no doubt be preferred ; but both the Minorca and Langshan are slow-growing and slow-feathering races, and to cross these two breeds confirms a weakness, which is in itself objectionable.

Others which may be mentioned are :—(4) White Leghorn—Buff Orpington ; (5) Brown Leghorn—Buff Orpington ; (6) Minorca—Buff Orpington ; (7) Ancona—Buff Orpington. Of

these the best in point of size is the Minorca cross, but the White Leghorns are hardier and yield rather more vigorous chickens. One great advantage of the Brown Leghorn—Buff Orpington cross is that in the colour of the plumage there is greater uniformity in the chickens than would otherwise be the case

A White Leghorn—Plymouth Rock cross is of great value, as both the parents are very hardy and active ; and although the colour of the eggs produced may not be so deep as in some of the crosses already named, yet it is sufficiently so to meet the market demands.

In the case of a Minorca—Wyandotte or a White Leghorn—Wyandotte cross, the object is to ensure a larger size in the egg, because the Wyandotte, although a prolific layer, produces eggs which are distinctly small, and in crossing it is desirable to remedy this weakness. The cross between the Minorca and the Wyandotte would ensure a much larger egg.

One great advantage which all breeds producing tinted eggs possess is that they are in general better winter layers than the varieties producing white-shelled eggs, this being perhaps due to the fact that they are usually very good sitters and mothers, and so obtain a rest during the spring and summer months.

There can be no question that one of the chief points which the egg producers in this country have to keep in view is the increase of the winter output, and if in combination a greater number of tinted eggs can be secured, a double advantage will be gained.

Regulations as to Fowl-Cholera in Germany.*

With a view to the prevention of fowl-cholera in Prussia, regulations exist defining the steps to be taken to prevent its extension. The regulations may be summarised as follows :—

Upon the outbreak of fowl-cholera the owner must at once notify the local authorities, isolate his fowls, and either burn the dead and slaughtered birds, or bury them with quicklime to a depth of about 20 in. Upon being notified the local authorities are to transmit one or two dead birds to the official veterinary surgeon for identification

* *Journal*, Vol. VIII., p. 538.

of the disease. As soon as the official veterinary surgeon has confirmed the existence of the disease, the infected yard is to have a notice bearing the word "Fowl-cholera" exhibited at the principal entrance, and the provisions as to burial and isolation are to be strictly enforced.

The removal from the premises of slaughtered birds during the period of isolation is prohibited.

Premises are considered to be no longer infected when either all the birds are dead or eight days have elapsed since the last case of disease. The premises have then to be disinfected: dung, food remains, and dirt are to be burnt or buried with quicklime; floors, walls, doors, perches, food-troughs are to be thoroughly cleansed with hot soda-water (6 lb. of commercial washing soda to 20 gallons of water), and lime-washed. If there is no flooring to poultry-sheds, the earth must be removed to a depth of at least 4 in. and mixed with quicklime. When disinfection has been carried out the premises are declared free from disease by notice in the official Press.

Afforestation of a Catchment Area at Leeds.

With reference to the enquiry as to the Afforestation of Catchment Areas, which was reported in this *Journal* (November, 1904, p. 468), it will be of interest to record the steps taken by the Corporation of Leeds towards planting a portion of the area under their control, as was suggested by the Departmental Committee on Forestry.

The area selected is known as the Washburn Valley, and it was inspected and reported upon in 1905 by Professor W. R. Fisher and Mr. S. Margerison, who have prepared a scheme of work to continue for five or six years on the assumption that the annual expenditure would be about £1,200. A woodman has been engaged, work of a preliminary character has been carried out at Swinsty Moor, and tree-planting has been commenced, about forty men, mostly engaged through the Unemployed Bureau, being engaged on it. These men were employed in burning the gorse, preparing the land, and digging holes for planting.

The portions to be planted in 1905 were the Swinsty Moor and the Horse Allotment Plantation, a total of 97 acres. There is also the laying out of a large nursery. The trees for the first year's work had been selected, the total number to be planted on Swinsty Moor being 360,750, consisting of spruce, Corsican pine, larch, Scots fir, beech, birch, sycamore, mountain elm, ash, black alder, and white alder.

The number of seedlings to be planted in the nursery is 638,000 of the above varieties. A large number of seeds will also be sown, so that in future years planting may go on without trees having to be purchased.

It is proposed to plant about 150 acres annually during the next five years, and if it is found that planting can be done more cheaply than is estimated at present more land will be taken.

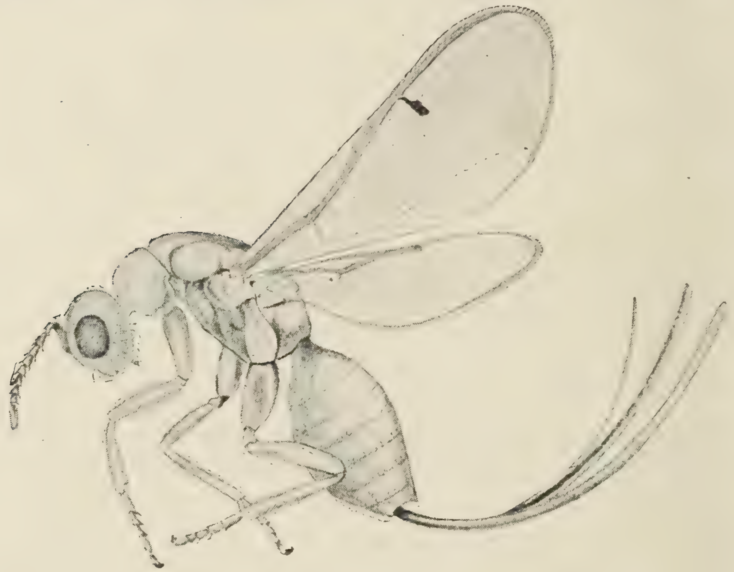
A New Enemy of the Douglas Fir. (*Megastigmus spermotrophus.*)

In the month of May, 1905, I received a number of seeds of the Douglas Fir that had been sent by Mr. John Crozier, of Durris, Aberdeenshire, to the Board of Agriculture and to myself. Accompanying the seeds were some insects that had issued from them. The insects on examination proved to be *Megastigmus spermotrophus*. From these seeds and from others I bred out a number of males and females of the species. The infested seed had been rendered useless by the destructive work of the *Megastigmus* larvæ. In the letter asking for the identification of the insect, Mr. Crozier wrote:—"The insect has for some years back been causing a serious loss to our stock of Douglas Fir seed. I noticed its presence on coming here nine years ago, but no doubt it had been on the estate before that time. Seed was plentiful, however, and as the acreage was comparatively trifling, I did not pay much attention to the fact. Now, however, it has assumed a more serious aspect, as the seed on many of the older trees from which I formerly collected my supply in good years, amounting to over 300 bushels, is not worth the trouble of gathering. I have raised some millions of plants on this estate, but unless

this pest can be kept in check it will be impossible to keep up the stock from home-grown supplies."

A number of points render this communication of Mr. Crozier's interesting.

In the first place, this is the first record of the insect in our country. Mr. W. F. Kirby very kindly wrote me to say that while two other species, viz., *Megastigmus collaris* and the large Californian species, *Megastigmus pinus*, were in the collection at the Natural History Museum, the present species, *Megastigmus spermotrophus*, was not represented. The insect,



a.

FIG. A.—Female greatly magnified. (Wachtl.)

occurs, too, as an enemy on a tree magnificent both for ornament and for timber, and justly regarded as one of the most valuable trees introduced in the last century. Although introduced into Britain only seventy-eight years ago, there are specimens in our country 130 ft. in height, and thick in proportion. Again, *M. spermotrophus* belongs to a family of Hymenopterous insects, the *Chalcididæ*, the larvæ of which in the great majority of cases are not feeders on plants but are parasitic on other insects. Further, while it is admitted that *some* species of

Chalcids are feeders on plants (phytophagic) it has been denied by such an excellent authority as Dr. L. O. Howard, of the United States, that species of the genus *Megastigmus* are directly phytophagic in habit. It is believed that the record of this infestation at Durris should go far, in view of previous evidence, to settle the controversy.

This insect, *M. spermotrophus*, was first received by Wachtl, of Vienna, in 1893, and was described by him as a new species. In the spring of 1893 Wachtl got some specimens of *Megastigmus* insects that had issued from the seeds of the Douglas Fir. From these specimens Wachtl described the male and female of our species.*

b

FIG. B.—Male greatly magnified. (Wachtl).

Description of Insect. — The female is loam-yellow, and measures from 3·25 millimetres to 3·5 millimetres; the eyes during life are coral-red, and after death red-brown; ocelli, red-brown, edged with black. The thirteen-jointed antennæ are blackish-brown, and end in a knob. The wings are translucent, and are finely black-haired; the knob or club of the ramus-stigmaticus† is longer than it is broad, elliptical, and black. The abdomen is compressed, and is red-brown on the upper side,

* Ein neuer Megastigmus als Samenverwüster von Pseudotsuga Douglasii, Carr. Winer Entomol. Zeitung 1893.

† The ramus-stigmaticus is the small branch (see Figure) which is given off from the part of the vein that runs along the front edge of each fore wing. Its varying size and shape in different species are made use of in classification.—R. S. M.

with a black-brown spot at the base of the first segment ; this spot varies in size in different individuals and may be absent. The projecting ovipositor is as long as the body and its sheath is intense black. The coxæ of the fore legs are yellow ; the pulvillus on all the legs black. Under magnification, small white hairs may be seen on the face, on the middle and hind legs, and on the tibiæ and tarsi of the fore legs, while black bristles are present on the forehead, thorax, femora of fore legs, and on the hind edges of the segments of the abdomen.

The male is orange-yellow, and measures from 2·75 millimetres to 3 millimetres. The antennæ are red-brown ; the bases of the wings are black. The tarsi of the fore legs and the whole of the middle and hind legs are reddish-yellow. The abdomen is markedly compressed and is brownish-red above, with a black longitudinal patch at its base. The hairing resembles that of the female.

FIG. C.—Larva, natural size and magnified. FIG. E.—Gnawing mouth parts of larva, greatly magnified.

So far as I know, the larva has not yet been described. It is whitish in colour and legless. The segments are well marked, and, indeed, the general appearance, including the wrinkled and curled form, is strongly reminiscent of a weevil grub. The marked horny head of the weevil grub, however, is absent. Instead, in the *Megastigmus* larva each of the two chitinised gnawing jaws is somewhat sickle-shaped, the two jaws reminding one of a pair of callipers. The apex of each jaw is pointed, and on the concave side is provided with prominent teeth. These gnawing mouth-parts are red-brown or yellow-brown in colour. Those shown in Figure E were drawn under a magnification of about 750.

Life History. — The flight-time of *M. spermotrophus* under normal conditions in Scotland is from May onwards. The females that have issued proceed to their egg-laying in the young Douglas Fir cones. The insects may be seen at this

time on the Douglas Fir trees, as also on the top of the seed-beds some time after sowing, these last having most likely issued from seed which had been sown.

Each infested seed of the Douglas Fir contains only one larva, which nourishes itself on the reserves contained in the seed. The seed bears no external mark of the internal presence of the *Megastigmus* larva. Pupation takes place in the seed, there being no cocoon. In a number of the seeds which I dissected, and from which *Megastigmus* adults had issued, the contents of the seed had been devoured and only the outer brown testa or seed-coat remained, surrounding the inner white-coloured perisperm sheath. In other seeds, on dissection, I found the larva, and where it was full-grown and the seed-contents destroyed, the white-coloured perisperm sheath surrounding the larva bore a close resemblance to a cocoon.

FIG. D.—Attacked seed of Pseudotsuga Douglasii from which the adult has issued (natural size and twice magnified orig.).

Starting from the first laid eggs of the spring brood of *Megastigmus*, the generation can probably be reckoned as an annual one. From Douglas Fir seeds received in May, I bred out males and females during May and June. Seeds of the same age dissected then also revealed larvæ. In dissection of seed during July, August, September, and October, I never failed to find healthy larvæ, and now in November I can still get larvæ, and all this with seed material from Douglas Fir cones harvested in October, 1904, and having their seed extracted in 1905. This can probably be accounted for partly by the considerable irregularities in time of hatching of eggs and coming to maturity known to occur in other insects with eggs laid at or about the same time, partly perhaps by the life

of the individual *Megastigmus* being somewhat extended, or perhaps also by the overlapping of generations with issue of adults at different times during the summer. An endeavour will be made in 1906 to clear up some of these points in the biology.

Wachtl in Mid-Europe bred out, in 1893, from seeds of the Douglas Fir, from March 30th to May 4th, a large number of *M. spermotrophus* of both sexes, the females predominating. Mr. Crozier got in ten days from seed blown through the fan in dressing or cleaning 182 adults, of which 142 were males. It is possible that this excess of males may be due to the fact that the males, being smaller than the females, the seeds enclosing the males, being somewhat lighter, would be the more likely to be blown through in dressing. I bred out from a very small quantity of seed in May and June thirty females and nineteen males.

The native home of the Douglas Fir, known also as the Oregon Pine and Columbia red wood, is Western North America, where it extends over an area of 50,000 square miles, between 43 deg. and 52 deg. latitude. *Megastigmus* has doubtless been introduced to Britain in seed from the native home of the tree. To what extent the insect may be present in Britain we cannot yet estimate, as comparatively few estates take advantage of the seed produced on the Douglas Firs grown on them. I would be very glad, in view of a later communication, to receive material from any estate of Douglas Fir or other cones for examination.

Protection and Remedy.—The insects are so small, and the number of cones on the tree may be so great, that direct measures to prevent egg-laying do not seem very practicable, yet it is worth keeping in mind that close allies of these insects are considered as amongst the easy prey of the collector, good hauls being got by netting and sweeping and beating the trees. Such sweeping or beating where *Megastigmus* brought itself within reach would be certain to account for numerous adults. Any adults that are seen on the seed-beds should also be destroyed.

Against the insect in its various stages in the seed, however, measures can probably be adopted with success.

The cones should be gathered as soon as ripe (the latter half of October) and should at once be subjected to such treatment

as will permit of the seed being abstracted. This seed should without delay be fumigated with bisulphide of carbon. The method is as follows :—Place the material to be treated in an air-tight receptacle. Pour the bisulphide of carbon into a saucer or saucers or other shallow dish, and lay these *on the top* of the material. Close the receptacle. The bisulphide of carbon vaporises, and as its fumes are heavier than air they sink down through the material. The receptacle should be kept closed for forty-eight hours. One ounce of bisulphide of carbon will do for 100 lb. of seed, or 1 oz. for every 50 cubic feet of air space. The treatment should be administered in not too cold a temperature. Bisulphide of carbon fumes being poisonous should not be inhaled by the operator, nor should a light of any kind be brought near.

If it is desired to store the cones during winter, or longer, these must be similarly fumigated directly they are gathered.

The results to be looked for from this fumigation with bisulphide of carbon are :—

1st. The germinative capacity of healthy uninfested seeds is not interfered with.

2nd. In infested seed where the larvæ may not have made much progress in destruction of the reserve in the seed, the larvæ will be killed and the seed may germinate.

3rd. In seeds infested, where the contents have been altogether or much destroyed, and which would therefore not have germinated, the enclosed larvæ will be killed, and the issue of the next year's generation of adults prevented.

The light seed blown through by the fan at cleaning time should be burnt at once, as where there has been attack this will probably account for many of the pests.

R. STEWART MACDOUGALL.

Destructive Insects in Timber.

An instance of serious injury being caused to stored timber, especially mahogany and walnut, has recently come under the notice of the Board. The injury was caused by the destructive beetle, *Lyctus canaliculatus*.

Life History.—The life history of this beetle may be thus described. The beetle chooses as its favourite

place for egg-laying crevices or cracks in dry wood. It does not confine its attention to one species of timber, but lays indifferently in many kinds of wood. Infestation is most likely where the timber has not been "impregnated," or treated with material to combat the attacks of insects and fungi, and is also most frequent in timber that has a marked alburnum or sap wood. From the eggs of the beetle hatch out grubs that have a curled wrinkled body and hard biting jaws. These grubs, when full fed, become pupæ in the burrows in the wood, and after a resting stage, differing in length according to the conditions, the beetles of the next generation are produced and proceed to a new egg-laying

Preventive and Remedial Treatment. — Apart from the general principles of not allowing the timber, when cut, to be long exposed, measures should be adopted to render the wood unlikely to be attacked by the beetles or other insects (or fungi). The protective measures to be adopted will vary with the purpose for which the timber has to be applied: *e.g.*, if for outside purposes, such as railway sleepers, creosoting is practised with success. Timber used for inside purposes can be rendered insect proof by its being either steeped in or painted over with such poisonous materials as sulphate of copper (wood so treated becomes somewhat brittle), or chloride of zinc (a 2 to 3 per cent. solution), or corrosive sublimate (this is a dangerous poison, which must be borne in mind if the timber so treated is required for use in houses). Whichever of these substances be used, a solution in methylated spirits (90 per cent. alcohol) is recommended in preference to an aqueous solution, as the former soaks in more readily.

To kill the insects (grubs and beetles) in timber found to be infested, the wood should be painted over with, or steeped in, the following:—780 grains naphthalene, 80 grains corrosive sublimate (very poisonous), $1\frac{1}{2}$ pints methylated spirits.

In painting the wood with this material care should be taken to give special attention to the crevices.

This is the most thorough way to prevent the spreading of the pest, as it should kill out the colonies, which are the centres from which the infestation is carried to freshly introduced timber. Unless this be done, the danger of new wood being attacked must continue.

If, however, for any reason the suggested treatment cannot be carried out, the following points should have attention :—

1. The careful isolation of new timber. To put such in the same chamber or shed with wood already infected is to invite attack.

2. Before being put aside for storing, new timber should be examined, and any holes made by the insect treated with corrosive sublimate, or with a mixture of carbolic acid and benzene.

3. Any timber that could conveniently be stored in air-tight chambers would receive protection by tiny phials of naphthalin placed here and there in the case or chamber. Such phials should be left unstoppered. Such treatment could, of course, only be applied to small timber.

4. A careful examination should be made of the infested stock. The worst attacked should be burnt; the least attacked could have the "holes" treated individually.

The spread of the pest could also be checked by surrounding, where practicable, the infected wood with coarse cotton, or with sacking, until ready for use. The beetles, which would issue from the timber, would be kept from spreading, and would be shaken from the sacking into paraffin. For very large timber that cannot be protected in this way nothing but complete isolation can effectually prevent the spreading of the beetle.

Introduction of Beneficial Insects into the United States.

There are many species of insects of great service in destroying other insects which are injurious to crops,* and efforts have lately been made in many countries to introduce and acclimatise those which are known to prey upon common pests. Not very much has been attempted in this way in the United Kingdom, but an experimental importation of Californian ladybirds (*Hippodamia convergens*) was made in 1903. (*Journal*, Vol. X., p. 501, March, 1904.)

Considerable activity in this direction has been displayed in recent years in the United States, and the Secretary for Agri-

* See article on "Beneficial Insects," Journal, Vol. V., p. 326, Dec., 1898.

culture states in his Report for 1905 that very important results have been gained in the introduction of beneficial insects. One of the most striking of these results was the importation and establishment of the fig-fertilising insect of South Europe. The insects were brought over alive and established in an orchard, with the result that after one year ten tons of Smyrna figs were produced. The crop has since continuously increased. Fresh orchards of Smyrna figs have been started, and a new industry has been established as a result of this importation.

The black scale has been for many years a serious enemy to the citrus and olive crops of California, and although a lady-bird enemy of the scale had been imported from Australia, it was efficacious only in certain portions of California, not thriving in other portions where these crops are largely grown. After several unsuccessful attempts to establish a parasite known as *Scutellista cyanea*, from Italy, it was found that this species also inhabits South Africa, and from that point specimens were introduced which bred at once in California, and have multiplied with such rapidity as to prove of great benefit to the growers of oranges, lemons, and olives.

The injury caused to the cotton crop by the cotton boll weevil is well known, and efforts have been made to discover some insect enemy which would be likely to keep it in check. An interesting ant-like insect, known as the "kalep," was discovered in 1904, in Guatemala, by an officer of the Bureau of Plant Industry, and was found to be such an important enemy of the cotton boll weevil in that country as to hold it distinctly in check, and to permit the cultivation of cotton where otherwise it would be impossible on account of the weevil. Colonies of this insect have now been introduced into the United States, but it is as yet impossible to state whether it will establish itself.

Another important insect pest in the United States is the San José scale, and a ladybird known as *Chilocorus similis*, has been imported from Northern China with the view of combating it. A systematic effort is also being made to import the European and Japanese natural enemies of the gypsy moth and the brown-tail moth.

Distribution of Grants for Agricultural Education.

The educational side of the work of the Board of Agriculture is dealt with in Dr. Somerville's Report on the Distribution of Grants for Agricultural Education and Research in 1904-1905. The grants in aid of local educational institutions in England and Wales amounted to £10,200, while there were in addition special grants for experiment and research to the sum of £425. The first-named sum was apportioned among seventeen separate collegiate and similar institutions for promoting the work of agricultural instruction, and for the maintenance of the farms attached to eight of them; it also included two grants of £250 each to enable lectureships in forestry to be established at the University College of North Wales, Bangor, and at the Armstrong College, Newcastle-on-Tyne. The results which have attended the establishment of these two lectureships are most encouraging. A considerable number of students have been found desirous of taking a full collegiate course of study, good classes of practical foresters and others have been conducted at selected local centres, while the demand on the part of landowners for expert advice from the lecturers has been considerably in excess of what might reasonably have been anticipated.

The special grants for experiment and research included £275 for experiments on the improvements of pastures conducted by Cambridge University, the Bath and West and Southern Counties Society, the Highland and Agricultural Society, and the West of Scotland Agricultural College; £100 for experimental work conducted by the Aberdeen Agricultural Research Association, and a contribution of £50 towards the expenses of the Home-Grown Wheat Committee in connection with the improvement of wheat.

It is pointed out in the Report that the main intention of the Board in granting financial assistance to educational institutions was the provision and maintenance of facilities for enabling the rising generation of agriculturists to obtain a thorough training in the science of their business. Concurrently with this object the Board had also in view the provision of opportunities for enabling farmers to obtain advice on technical matters affecting their calling. Primarily, therefore, the colleges and schools which

have been started during the past fifteen or sixteen years were intended to be of direct service to English farmers, and there is no reason to doubt that they have accomplished this object. But it is worthy of mention that a not inconsiderable number of the best students have been attracted from the practice of agriculture by the offer of research and teaching appointments, and are now filling many of the more important chairs and lectureships in this country. The demand, too, for highly-trained specialists for service in India and our Colonies—though also to a considerable extent in other parts of the world—has induced many of our younger men to go abroad, where they are now filling responsible administrative and educational positions. It is, in fact, becoming more and more recognised that agricultural science offers to our best students a career which is certainly not less attractive than that presented by the older and more conventional professions.

Information as to the organisation of instruction and research at the institutions aided by the Board during the past year is given in the Appendix. It is satisfactory to find that the demand for instruction on the part of students is fully maintained, while at the same time there is unmistakeable evidence of increased appreciation on the part of farmers of the opportunities afforded by the collegiate centres for obtaining scientific advice and assistance. At one centre (Chelmsford) practical farmers are brought into intimate contact with the scientific staff through the agency of conferences held in the afternoon of the weekly market day. These gatherings are well attended and appear to fit in with the conditions of this particular district, and although it cannot be argued that similar meetings would necessarily be successful in other market towns, it would be interesting to have the idea put to the test where local circumstances appear to be favourable.

A large amount of detailed information has also been brought together in a second Appendix in regard to education in rural districts through the agency of school gardens. This is a subject to which the Board during recent years have given much attention, believing, as they do, that the school garden is an important agency in the training of the mind, the hand, and the eye of the youth of our rural population. While great variation

is found to exist in regard to many of the details of this form of instruction, it is interesting to find that success may be achieved by a variety of methods, and the results of the inquiry set forth in the Appendix can hardly fail to be of use not only to counties that are about to start school gardens, but also to those which already possess them.

A general survey of the various forms of agricultural instruction provided by County Councils throughout England and Wales is given in Appendix III., and Appendix IV. is a statement showing the amount received from the Residue Grant under the Local Taxation (Customs and Excise) Act, 1890, and the expenditure upon agricultural instruction by County Councils in England and Wales. This shows that during the past four years there has been a very serious diminution in the aggregate amount of the grant. The total available for use in the year 1901–2 amounted to £764,353, whereas in the year ending March, 1905, it was only about £693,000. Notwithstanding a steadily falling grant available for the years up to 1904, the County Councils were able to increase the aggregate sum expended on agricultural education during that period, but the figures for the succeeding year show that expenditure in this direction has had to be curtailed, and, in fact, is now less than it was in 1901–2, when the amount available under the Act of 1890 was much greater. Turning to the various forms of agricultural education, it appears that expenditure on dairying, poultry-keeping, and bee-keeping has remained fairly steady, whereas there has been diminishing support in the direction of agricultural lectures, farriery, and manual processes. The sums set aside for the provision of scholarships have undergone little change during the past four years. Grants to colleges and schools, on the other hand, have been much reduced, a condition of things probably accounted for, in large part, by abnormal expenditure on buildings during previous years.

The Board have received through the Foreign Office an account of a Danish Agricultural School, which has been founded for the purpose of training and instructing allotment-holders and labourers of both sexes. The school, which is situated near Ringsted, is called the Kaerehave Agricultural School, and was opened on November 3rd, 1903. The need for the education which the school offers is indicated by the great number of persons who have taken advantage of the course of instruction. During the short time it has been open it has been attended by 375 pupils for long courses and by 800 other persons for shorter periods. The pupils are chiefly the girls and farm hands, from twenty to twenty-five years of age, who attend for a period of five to six months, although some remain for a full year. The persons attending the short courses consist of generally cottagers and allotment-holders from twenty-five to fifty years of age. They visit the school for eleven days at a time, but may attend several times if they desire to do so. Only a limited number of the allotment-holders in Denmark are, it is stated, able to live on the produce of their plots, without having to seek other employment, and the object of the Kaerehave School is to give these persons such a practical and theoretical training that they may be able to turn their holdings to better account.

Danish School for Allotment-holders.

The school, which is the first and only one of its kind in Denmark, is the outcome of a Committee appointed about four years ago by the Minister of Agriculture for Denmark, which reported in favour of the establishment of schools for the instruction of small holders by short courses of lectures, &c., dealing particularly with farming in a small way and the minor rural industries. The Ministry granted this school a loan of £3,330 on easy terms of repayment, and funds have also been obtained from private sources. The town of Ringsted gave 54½ acres of land for the purposes of cultivation, so that the property of the school is now estimated at about £8,330. Part of the land is cultivated as model plots of various sizes, while experimental gardens with fruit trees, bushes and vegetables, have been established. Poultry, bees, rabbits, are kept, as well as cattle and pigs.

Miscellaneous Notes.

Demand for Agricultural Machinery in South Africa.—The following particulars respecting the trade in agricultural machinery in the Orange River Colony and the Transvaal, taken from the *Bulletin Commercial* (Brussels) of 2nd December, may be of interest:—The development of agriculture, and more especially the increased use of scientific methods, are creating a large demand for agricultural machinery in the Orange River Colony and the Transvaal. At the present time, owing to the lack of draught animals, light ploughs are generally used, but as soon as larger areas of land are under cultivation more powerful machinery will be required.

To give an idea of the demand for agricultural machinery in South Africa the following list of machinery imported at East London in one year by one German firm alone may be quoted:—10,000 ploughs from America, 9,500 sowing machines, 350 harvesters, 200 maize sowing machines, 300 hydraulic rams, 15 perforators, 1,500 decorticators, 4 steam ploughs, 5 steam threshing machines from the United Kingdom, 16 steam traction engines for agricultural purposes, 1,750 skimming machines from Sweden, and 1,000 ploughs from Germany.

Reduced Railway Tariff for Agricultural Implements in Italy.—The *Bollettino delle Finanze* (Rome) of 17th December states that the Administration Committee of the State Railways have decided to grant a specially reduced tariff for the transport of agricultural implements, with a view to stimulating the development of home agriculture.

Agricultural Machinery in Asia Minor.—The *Levant Herald* remarks on the need for agricultural tools and machines in the farming districts of Anatolia, and states that the United States Consular-Agent in Samsoon, who is agent for American machinery, made a trip recently through the country, during which he made considerable sales of farm implements, including mowers, binders, reapers, flour mills, engines, threshing machines, ploughs, &c.

Protection of Fruit Bushes against Birds.—It has been suggested that disbudding of fruit bushes by birds can be satisfactorily guarded against by means of cheap loosely-spun white cotton thread, which is thinly interwoven with the branches,

and the suggestion seems worthy of a trial. Such thread can now be obtained from many seed firms.

Protection of Trees against Rabbits.—A home-made composition for protecting young trees against rabbits may be prepared by taking approximately equal quantities of blood, cow-manure, and lime, mixing them together, and adding a small quantity of *Asafoetida*, say 2 or 3 per cent.

If renewed now and again it will prove fairly effective, and will not injure the trees.

Seed Control in Canada.—An Act providing for the Inspection and Sale of Seeds in Canada came into force on the 1st of September last. It prohibits the sale of seeds of cereals, grasses, clovers, or forage plants containing any admixture of certain specified weed-seeds, unless the package containing them bears a statement to that effect.

No package of seeds shall be marked in such a way as to imply that they are of first quality, unless they are free from a number of specified weeds, and contain 99 per cent. of seed of the kind or kinds represented, or seeds of other useful and harmless grasses and clovers, of which 90 per cent. must be germinable. In the case of timothy, alsike, or red clover, or any mixture containing these seeds, the specified weed-seeds are not to be present in a greater proportion than five per thousand.

The provisions of the Act are not to apply to seed marked "not absolutely clean," and held or sold for export only.

The United States Apple Crop.—According to the *American Agriculturist* for November 4th lastthe United States apple crop of 1905 has proved the smallest for some years past. An estimate based on returns from leading growers and dealers and on the State reports, places the total crop at 23,500,000 barrels, as against nearly 45,500,000 barrels in 1904, 42,600,000 barrels in 1903, and 46,600,000 in 1902. It is remarked that the present year's crop may be compared with the small yield of 1901, which was approximately 27,000,000 barrels. The largest crop on record was in 1896, when the yield of 70,000,000 barrels, resulted in apples being a drug in the market for several months. This year's crop in the great producing sections of the middle and central States is considerably under 9,000,000 barrels as

compared with about 20,000,000 barrels a year ago, while in the New England States the crop is substantially less than half that of last year. In the far western States only does the crop approach the normal yield, and among these States California is credited with a yield about 10 per cent. better than last year, though somewhat under the previous two years. The reasons given for the great shortage are that although there was great promise of a good crop in so far as bloom was concerned, heavy and continuous rains prevented fertilisation, and continued low temperatures destroyed the vitality of young fruit buds.

Agriculture in Rhodesia.—Owing to its fertile soil, regular wet season, ample rainfall, genial climate and cheap land Rhodesia offers prospects for successful farming operations which compare favourably with many British Colonies.

Mealies—maize or Indian corn—are the staple cereal product of Rhodesia at present, and by careful cultivation can be made to produce as heavy a yield per acre as in any part of the world. Wheat is found to grow well and yield abundantly in many parts of the country, and its cultivation is being extended. Root crops of all kinds do remarkably well, and yield heavily, especially potatoes, for which there is always a fair local demand at good prices. Tobacco grows well, the cultivation of cotton is receiving attention, and gives every promise of proving to be a paying crop.

Small stock, particularly native sheep and goats, Cape Boer goats, Persian sheep, and the Cape fat-tailed sheep thrive remarkably well all over Rhodesia, and the increase is rapid. On some of the mountain ranges on the Eastern Section merino woolled sheep do well, and as the country becomes more heavily stocked and the ranker grasses are fed off, the area on which the merino can be grazed will be considerably extended. Cattle thrive well everywhere and remain sleek through the dry season on the natural grazing of the veldt, and require no artificial feeding whatever.

Rhodesia is said to offer good prospects to men of energy and enterprise equipped with some knowledge of agriculture and a capital of from £500 to £1,000. The average size of farms in Mashonaland is approximately 3,000 acres. The terms on which land can be acquired can be ascertained on

application to the British South Africa Company, 2, London Wall Buildings, E.C.

Exhibition at Bucharest.—An Exhibition will be held at Bucharest in 1906, under the auspices of the Roumanian Government, to commemorate the 40th anniversary of King Charles' reign. The Government have voted a sum of £180,000 to defray the cost of the buildings of the Exhibition and to cover the expenses of organisation. It will be open from the 1–14th June to 1–14th November, and foreign exhibitors are invited to participate in respect to certain classes of exhibits, among which the following may be mentioned : Machinery of all kinds relating to agriculture, forestry, horticulture, breeding, poultry, bee-keeping, dairying, and the silkworm industry ; application of motive power to agriculture ; milling machinery of all kinds ; trees, vine-stocks, vegetables and flowers (including seeds) capable of cultivation in Roumania, and superior to native species ; chemical manures, and live stock of all kinds. Great importance is attached to the exhibition of cereals of superior quality and to grass seeds of different kinds, which can be grown in the grounds of the Exhibition. The charges for space for foreign exhibits are to be lower than for native exhibits. A copy of the rates, with other particulars, can be seen at the Offices of the Board, 4, Whitehall Place, S.W. Reduced rates on goods for exhibition have been arranged on Roumanian railways and on steamships running from Rotterdam to Constantza. Applications for information should be addressed to Dr. Istrati, Commissaire-Général, Exposition Générale Roumaine, Bucharest.

ADDITIONS TO LIBRARY DURING DECEMBER.

Australasia—

A.B.C. of Queensland Statistics, 1905. (35 pp.)
Queensland.—Vital Statistics, 1904. (62 pp.)
Queensland.—Statistics of the State of Queensland for 1904. (456 pp.)

Belgium—

Congrès International de l'Enseignement Agricole, Liège, 1905. Tome 1[er] :—Rapports et Documents Préliminaires. (682 pp.) Tome 2[e] :—Compte Rendu des Travaux du Congrès. (163 pp.)

Canada—

Report of the Select Standing Committee on Agriculture and Colonisation, 1904. (714 pp.)

France—

Vacher, Marcel.—L'Agriculteur et la Main d'Œuvre. (89 pp.) 1892.

Germany—

Krafft, Dr. G.—Lehrbuch der Landwirtschaft. Band I. Ackerbaulehre. (316 pp.) Band II. Pflanzenbaulehre (279 pp.) Band III. Tierzuchtlehre. (280 pp.) Band IV. Betriebslehre. (255 pp.) 1904–5.
Martin, Dr. H.—Die Forstliche Statik. (361 pp.) 1905.

Great Britain—

City of Leeds.—Afforestation. Reports on the Afforestation of the Washburn Valley Estate, by Prof. W. R. Fisher and by Mr. Samuel Margerison. (48 pp.) 1905.
Wright, J.—Profitable Fruit Growing for Cottagers and Small Holders of Land. (127 pp.) 1903.

India—

Department of Revenue and Agriculture.—Agricultural Statistics of India for the years 1899–1900 to 1903–1904. Vol. I., British India. (385 pp.) Vol. II., Native States. (76 pp.) 1905.
The Ceylon Blue Book, 1904. (1,000 pp.)
Central Provinces, Department of Agriculture.—Report on the Experimental Farms for 1904–5. (32 pp.) 1905.
Punjab.—Veterinary College and Civil Veterinary Department. Report for 1904–5. (30 pp.) 1905.
Lucknow.—Report on the Government Horticultural Gardens for 1904–5. (9 pp.) 1905.

Sweden—

La Lutte contre la Tuberculose en Suède (Ouvrage dédié au Congrès International de la Tuberculose à Paris, 1905). (281 pp.)

United States—

Harwood, W. S.—New Creations in Plant Life. (368 pp.) 1905.
Department of Agriculture.—Report of the Chief of the Weather Bureau, 1903–4. (381 pp.) 1905.
Report of the Secretary of Agriculture, 1905. (132 pp.)
Biological Survey.—Bull. 23. Horned Larks and their relation to Agriculture. (35 pp.) 1905.
Farmers' Bulletin, No. 234. The Guinea Fowl and its use as Food. (24 pp.) 1905.
No. 236. Incubation and Incubators. (31 pp.) 1905.
Forest Service.—Bull. 64. Loblolly Pine in Eastern Texas. (53 pp.) 1905.
Bureau of Plant Industry :—
Bull. 85. The Principles of Mushroom Growing and Mushroom Spawn Making. (60 pp. + vii. plates.) 1905.
Bull. 86. Agriculture without Irrigation in the Sahara Desert. (27 pp. + v. plates, 1905.
Cornell University :—
Bull. 221. Alfalfa in New York. (14 pp.) 1905.
Bull. 223. The Grape-Berry Moth. (41–60 pp.) 1905.
Bull. 224. Two Grape Pests. (61–76 pp.) 1905.
Bull. 225. Bovine Tuberculosis. (77-92 pp.) 1905.
Bull. 227. Mushroom Growing. (413–424 pp.) 1905.
Bull. 228. Potato Growing in New York. (425–455 pp.) 1905.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of December, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 9	7 4	37 2	33 10
Herefords	7 9	7 3	—	—
Shorthorns	7 8	7 0	36 1	33 0
Devons	7 10	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7¾	7	8½	6½
Sheep :—				
Downs	9	8	—	—
Longwools	8½	7¾	—	—
Cheviots	9¼	8½	8¾	7¾
Blackfaced	8½	7½	8½	7½
Cross-breds	8¾	8	9	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 10	6 6	6 11	6 1
Porkers	7 6	7 1	7 6	6 7
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 7	18 0	19 9	17 4
,, —Calvers ...	20 7	17 8	18 10	16 4
Other breeds—In Milk ...	17 17	15 5	20 4	16 12
,, —Calvers ...	—	13 10	19 1	15 8
Calves for Rearing	2 0	1 12	2 9	1 13
Store Cattle :—				
Shorthorns—Yearlings ...	8 14	7 5	8 17	7 11
,, Two-year-olds	12 4	10 13	13 4	11 3
,, Three-year-olds	15 2	14 1	13 15	12 0
Polled Scots—Two-year-olds	—	—	16 3	13 1
Herefords— ,,	14 8	12 5	—	—
Devons— ,,	12 7	10 19	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	40 8	36 10	—	—
Scotch Cross-breds ...	—	—	31 3	27 3
Store Pigs :—				
Under 4 months	26 8	19 9	22 10	17 10

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	49 6	49 0	47 0	46 0	56 0*	53 6*
	2nd	47 6	44 0	42 6	41 6	53 6*	45 0*
Cow and Bull ...	1st	—	40 6	40 0	38 6	46 0	40 0
	2nd	—	35 6	35 0	34 0	37 6	34 0
U.S.A. and Canadian :—							
Birkenhead killed	1st	49 0	45 6	45 6	46 6	46 0	46 6
	2nd	43 6	40 6	41 0	42 6	42 6	42 0
Argentine Frozen—							
Hind Quarters ...	1st	30 6	32 6	31 6	30 6	32 6	33 0
Fore ,, ...	1st	27 6	28 0	28 0	28 0	29 0	29 6
Argentine Chilled—							
Hind Quarters ..	1st	34 6	37 0	36 0	36 6	—	37 6
Fore ,, ...	1st	29 0	28 6	28 0	31 0	—	28 0
American Chilled—							
Hind Quarters ...	1st	53 0	51 6	52 0	52 0	52 0	52 6
Fore ,, ...	1st	31 6	33 0	32 6	32 6	34 6	34 0
VEAL :—							
British	1st	68 0	60 0	66 6	72 6	—	—
	2nd	60 0	51 6	58 6	64 0	—	—
Foreign	1st	68 0	—	—	—	—	63 0
MUTTON :—							
Scotch	1st	69 0	67 0	72 6	70 6	71 0	66 0
	2nd	63 6	51 6	66 6	66 0	56 0	55 0
English	1st	66 0	69 6	69 0	64 6	—	—
	2nd	59 6	57 6	64 0	57 0	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	65 6	—	65 6	—	—
Argentine Frozen ...	1st	32 0	31 0	30 6	30 6	30 6	30 6
Australian ,, ...	1st	30 6	28 6	28 0	29 0	30 6	—
New Zealand ,, ...	1st	39 0	42 0	40 0	38 6	31 6	—
LAMB :—							
New Zealand ...	1st	42 0	45 0	42 0	39 6	44 6	—
Australian	1st	40 0	39 6	39 6	39 6	42 0	—
Argentine	1st	37 6	37 6	—	—	—	—
PORK :—							
British	1st	67 0	66 6	66 6	67 0	57 0	57 6
	2nd	59 6	59 0	61 0	61 0	54 0	48 0
Foreign	1st	64 6	49 6	51 6	51 6	—	51 6

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1904, and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1	30 9	22 10	22 5	25 2	17 0	16 8	16 10
,, 18 ...	25 1	28 6	30 10	22 9	22 9	24 11	16 10	16 7	16 10
,, 25 ...	25 2	28 2	30 9	22 4	22 8	25 2	17 0	16 7	17 0
Apl. 1 ...	25 3	27 11	30 9	22 6	22 10	25 1	17 0	16 6	16 11
,, 8 ...	25 4	27 10	30 9	21 10	22 5	25 6	17 2	16 5	17 0
,, 15 ...	25 6	27 9	30 8	21 6	22 6	24 3	17 3	16 4	17 6
,, 22 ...	26 1	27 9	30 8	21 9	22 0	24 4	17 9	16 4	17 5
,, 29 ...	26 10	27 8	30 9	22 1	21 1	24 4	18 0	16 3	17 9
May 6 ..	27 6	27 4	30 8	21 10	20 8	25 3	18 2	16 7	18 0
,, 13 ...	27 9	27 1	30 8	22 5	19 10	24 10	18 4	16 6	18 3
,, 20 ...	27 10	26 9	30 10	23 7	20 4	24 8	18 5	16 7	18 5
,, 27 ...	27 8	26 9	30 11	23 7	19 8	24 4	18 5	16 7	18 8
June 3 ...	27 6	26 10	31 3	23 10	18 8	23 6	18 4	16 8	19 1
,, 10 ...	27 8	26 6	31 4	21 5	18 5	24 0	18 7	16 10	18 11
,, 17 ...	27 6	26 5	31 7	20 7	18 2	26 0	18 3	16 8	19 1
,, 24 ...	27 6	26 5	31 7	22 0	19 2	23 9	18 6	16 10	18 10
July 1 ...	27 9	26 4	31 8	20 7	18 8	23 2	18 6	17 1	19 7
,, 8 ...	28 1	26 6	32 1	19 11	19 8	22 11	18 3	17 1	19 6
,, 15 ...	28 3	26 10	32 3	20 5	18 9	23 10	18 7	17 6	19 7
,, 22 ...	28 7	27 7	32 2	20 10	18 10	23 7	18 5	17 6	18 11
,, 29 ...	28 11	28 0	32 3	21 0	19 9	23 11	18 6	17 10	19 3
Aug. 5 ...	29 3	28 3	31 11	20 1	19 9	22 0	18 8	17 10	18 4
,, 12 ...	29 11	28 4	30 5	21 3	19 9	22 5	18 10	17 7	16 11
,, 19 ...	29 9	28 8	28 5	20 4	22 5	23 4	18 6	16 7	16 4
,, 26 ...	30 0	29 5	27 1	22 3	23 2	23 6	18 7	16 5	15 9
Sept. 2 ...	30 3	30 2	26 11	22 5	25 3	23 5	18 5	16 3	15 9
,, 9 ...	28 6	30 0	27 1	22 4	24 10	23 4	17 0	16 1	15 11
,, 16 ...	27 5	29 7	26 11	24 2	24 9	23 7	16 4	15 11	16 0
,, 23 ...	27 0	29 10	26 8	24 0	25 10	23 10	16 2	15 9	15 11
,, 30 ...	26 3	29 10	26 9	23 9	25 5	24 3	15 9	15 8	16 1
Oct. 7 ...	25 10	30 2	26 9	23 8	25 6	24 9	15 6	15 9	16 3
,, 14 ...	25 8	30 5	26 11	23 9	25 4	24 10	15 5	15 8	16 6
,, 21 ...	25 10	30 4	27 1	23 7	25 5	25 0	15 8	15 11	16 7
,, 28 ...	26 0	30 6	27 4	24 2	24 11	24 11	15 8	15 10	16 8
Nov. 4 ...	26 4	30 6	27 10	24 3	25 0	24 9	15 9	16 0	17 1
,, 11 ...	26 6	30 3	28 3	24 6	24 6	24 10	15 9	15 11	17 4
,, 18 ...	26 9	30 2	28 7	24 3	24 5	24 6	15 10	16 0	17 8
,, 25 ...	26 6	30 5	28 5	23 11	24 4	24 6	15 11	16 1	17 9
Dec. 2 ...	26 8	30 4	28 8	23 9	24 6	24 6	15 9	16 2	17 11
,, 9 ...	26 7	30 4	28 6	23 2	24 4	24 7	15 9	16 2	17 11
,, 16 ...	26 9	30 4	28 5	23 0	24 4	24 5	15 7	16 2	17 11
,, 23 ...	26 5	30 3	28 4	22 5	24 7	24 6	15 6	16 1	17 11
,, 30 ...	26 3	30 4	28 3	22 1	24 8	24 7	15 5	16 2	18 1

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	November...	39 1	38 9	23 1	24 3	17 8	20 8
	December...	39 10	39 6	23 4	24 9	18 1	20 10
Paris:	November...	40 4	39 11	23 3	25 1	19 1	21 7
	December...	41 1	39 9	23 10	25 5	19 3	22 4
Belgium:	October ...	31 6	30 6	23 0	22 10	19 9	20 0
	November...	31 4	30 9	22 9	23 7	21 6	20 9
Berlin:	October ...	38 9	38 0	—	—	19 7	20 11
Breslau:	October ...	36 7	34 1	25 7	25 9	18 5	19 1

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of December, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	31 0	29 11	23 10	24 7	17 0	18 11
Norwich	30 4	28 7	24 8	24 5	15 8	17 9
Peterborough ...	30 0	27 9	23 6	24 1	15 10	17 6
Lincoln	30 2	27 11	22 11	23 10	15 10	17 9
Doncaster	29 8	28 0	23 6	23 6	15 7	17 7
Salisbury	29 0	28 5	23 11	25 6	15 11	18 3

CORN PRICES:—ANNUAL AVERAGES.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Weekly Averages of Corn Returns from the Returning Markets, together with the QUANTITIES returned as sold at such Markets during each of the years 1899 to 1905.

Years.	Prices.			Quantities.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	s. d.	s. d.	s. d.	*Quarters.*	*Quarters.*	*Quarters.*
1899 ...	25 8	25 7	17 0	3,530,961	3,296,744	776,361
1900 ...	26 11	24 11	17 7	2,923,483	3,190,793	711,784
1901 ...	26 9	25 2	18 5	2,605,550	3,369,629	714,215
1902 ...	28 1	25 8	20 2	2,247,937	2,783,424	831,285
1903 ...	26 9	22 8	17 2	2,296,723	2,875,749	1,049,995
1904 ...	28 4	22 4	16 4	2,138,142	3,437,176	1,316,516
1905 ...	29 8	24 4	17 4	2,467,551	3,265,613	1,073,611

AVERAGE VALUE per IMPERIAL QUARTER OF WHEAT IMPORTED into the UNITED KINGDOM from the undermentioned Foreign Countries and British Possessions in the years 1903, 1904, and 1905.

Countries from which Exported.	Average Value per Imperial Quarter.		
	1903.	1904.	1905.
	s. d.	s. d.	s. d.
Argentine Republic	28 6	30 1	30 7
Chile	30 0	30 8	30 4
Germany	29 2	31 2	31 11
Bulgaria	27 3	—	—
Roumania	28 10	29 5	31 0
Russia	29 0	30 9	31 9
Turkey	26 9	25 4	28 1
U.S. of America, Atlantic ...	29 9	30 7	31 9
U.S. of America, Pacific... ...	30 5	30 8	31 7
India, British	28 5	28 7	29 8
North America, British	29 8	30 10	31 8
Australia	—	31 4	32 4
New Zealand	—	29 7	30 1

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1905.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	15 9	14 0	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	117 6	115 6	—	—	107 0	104 6	116 6	—
Danish ...	120 6	118 6	125 0	121 0	123 6	119 6	121 0	—
Russian ...	108 6	105 0	117 0	115 6	106 0	103 0	105 6	—
Australian ...	114 0	112 0	116 0	112 0	114 6	112 6	117 6	114 0
Argentine ...	115 0	112 0	—	—	117 0	113 6	116 0	—
CHEESE :—								
British, Cheddar	75 0	68 6	—	—	74 0	68 0	65 6	62 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	75 0	67 0	77 0	68 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	63 0	61 6	64 0	62 6	63 0	61 0	63 0	61 0
BACON :—								
Irish	64 6	61 6	66 6	63 0	64 0	61 0	63 0	61 0
Canadian ...	55 6	53 6	53 6	50 6	54 0	51 6	56 0	53 0
HAMS :—								
Cumberland ...	103 0	101 0	—	—	—	—	—	—
Irish	105 0	101 0	—	—	—	—	94 0	84 0
American (long cut) ...	54 0	50 6	50 0	47 0	48 0	45 6	49 6	48 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	19 4	17 3	—	—	—	—	—	—
Irish	17 10	15 6	14 6	12 10	14 6	14 0	16 0	13 6
Danish ...	16 0	14 6	15 7	13 9	15 6	14 6	16 1	14 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	76 0	66 0	—	—	71 6	65 0	60 0	50 0
Scottish Triumph...	70 0	58 6	58 6	49 6	45 0	36 6	—	—
Up-to-Date ...	70 0	55 0	63 0	54 0	45 0	36 6	45 0	40 0
HAY :—								
Clover... ...	89 0	78 0	86 0	73 0	85 0	65 0	73 6	68 6
Meadow ...	78 0	66 6	73 6	70 0	—	—	72 6	67 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	DECEMBER.		12 MONTHS* ENDED DECEMBER.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	92	71	817	1,196
Swine Slaughtered as diseased or exposed to infection ...	600	319	3,876	5,603
Anthrax :—				
Outbreaks	91	132	967	1,049
Animals attacked	124	211	1,333	1,589
Glanders (including Farcy) :—				
Outbreaks	105	126	1,208	1,529
Animals attacked	165	189	2,062	2,658
Sheep-Scab :—				
Outbreaks	140	239	918	1,418

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	DECEMBER.		12 MONTHS* ENDED DECEMBER.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	—	2	48	182
Swine Slaughtered as diseased or exposed to infection ...	1	76	1,416	4,144
Anthrax :—				
Outbreaks	1	—	4	4
Animals attacked	1	—	4	7
Glanders (including Farcy) :—				
Outbreaks	2	—	30	11
Animals attacked	7	—	106	34
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	62	48	339	463

* The twelve months comprise 53 weeks in 1904 and 52 weeks in 1905.

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XII. No. 11.

FEBRUARY, 1906. [NEW SERIES.]

INOCULATION OF LEGUMINOUS PLANTS.

The use of inoculating materials for leguminous plants has been the subject of investigation both in Germany and the United States of America; in the former, Dr. L. Hiltner prepared a new culture as a development of his "nitragin" which formed the subject of experiments in England some years ago, while in the latter Dr. G. T. Moore introduced a new form of inoculating material which received the sanction of the United States Bureau of Plant Industry at Washington.

With a view of testing the cultures in this country, the Board of Agriculture and Fisheries sought the co-operation of the Agricultural Colleges and Experiment Stations, and reports have now been received by the Board from the following centres:—

Aberdeen and North of Scotland Agricultural College	Report sent by	R. B. Greig, Esq.
Aberystwith, University College of Wales	,, ,,	D. D. Williams, Esq.
Bangor, University College of North Wales	,, ,,	Prof. Thos. Winter.
Cambridge, University	,, ,,	Prof. T. H. Middleton.
Chelmsford, County Technical Laboratories	,, ,,	G. Clarke, Esq. F. T. Chittenden, Esq.
Edinburgh, Edinburgh and East of Scotland College of Agriculture	,, ,,	Wm. Bruce, Esq.
Glasgow, West of Scotland Agricultural College	,, ,,	Prof. R. Patrick Wright.
Kingston, Midland Agricultural and Dairy Institute	,, ,,	John Golding, Esq.
Leeds, The University	,, ,, ,, ,,	Prof. R. S. Seton. Dr. W. G. Smith.
Newcastle, Armstrong College	,, ,,	Prof. Douglas A. Gilchrist.
Reading, University College	,, ,,	John Percival, Esq.
Woburn, Royal Agricultural Society's Experiment Station	,, ,,	Dr. J. A. Voelcker.
Wye, South-Eastern Agricultural College	,, ,,	M. J. R. Dunstan, Esq.

Most of the cultures were supplied by the Board of Agriculture, together with suggestions as to the plan of the experiments, but some cultures were sent direct to the centres from Munich and Washington.

The cultures and methods of use have been described in this

Journal, see Vol. XI., page 348, September, 1904; page 669, February, 1905; and page 725, March, 1905.

The cultures from Munich were, on the whole, fresher than those from Washington, which latter were, in some cases, received as early as the autumn of 1904, though they could not be used till the following spring.

Dr. Hiltner prepares his cultures on petri dishes direct from the healthy nodules of similar plants to those for which they are designed. From these plates the tube cultures are made, and the "virulence" of each culture is tested by the following method:—Small pots are filled with a mixture of sand and peat,

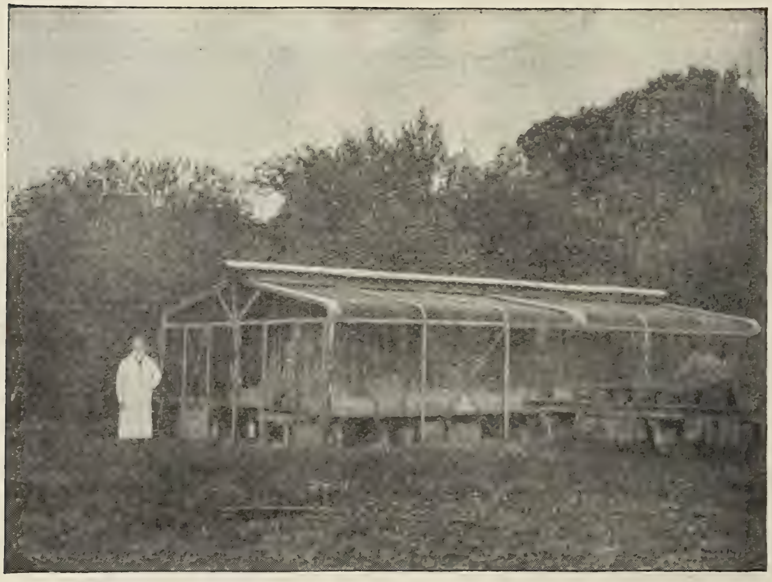


FIG. 1.—VIEW OF DR. HILTNER'S EXPERIMENT HOUSE.

the latter in small quantities only; the pots are then covered with cotton-wool, sterilised in an autoclave, and cooled. Seeds which have been germinated under sterile conditions are then planted in the pots, and the inoculations made, three pots being taken for each test. Only such cultures as produce abundant healthy nodules on the roots of all the plants in the inoculated pots are used for obtaining sub-cultures for distribution.

It will be seen that though the proof of these cultures, and the making of sub-cultures, takes some time, the cultures sent out correspond as nearly as circumstances permit, to the natural state in which they grew in the nodules.

The illustrations (Figures 1 and 2) show the wire cage, protected by waterproof roller-blinds, in which Professor Hiltner conducts these trial experiments.

Dr. Moore's cultures were sent out absorbed on cotton-wool, covered with tinfoil, and accompanied by two kinds of salts to be used with water in making fresh cultures.

The directions given by Dr. Moore were closely followed in most cases, but it should be mentioned that the cloudiness, which is said to be produced in the solution as a result of the growth of the organism, was not always observed. It was also noted that the liquid contained bacteriological impurities (such as *Oïdium lactis*) in great quantity. The manipulation of these cultures does not seem to have presented any serious practical difficulties; it is, however, difficult on a farm to keep the necessarily large volumes of liquid at the temperature necessary for the growth of the organisms, and unless this is done no satisfactory result can be expected, if, as is claimed, the organism which grows in these solutions is to be capable of infecting the plant.

FIG. 2.—ANOTHER VIEW OF DR. HILTNER'S EXPERIMENT HOUSE.

The inoculation of seed or soil is easy and rapid with either kind of culture. Seeds, for instance, can be placed in butter

muslin and dipped in a pail containing the liquid preparation of the culture to be used. The muslin is allowed to sink until the liquid just covers the seeds; the corners of the muslin are then gathered up, and the seeds lifted out. In this way it is possible to dress sufficient seed for several acres from one pailful of culture.

Some of the smaller seeds, such as clover, seemed to be injured by this soaking in liquid, and this affords a possible explanation of the failure of the crop at several centres, and of the better yield of the undressed plot over the dressed.

In one case, however, in which peas were used, an opposite result was obtained, and it was thought the soaking process with the American manurial solution had had a beneficial result, independently of the organisms which it contained. In any case it would seem very desirable to dress the seed for control plots with a solution similar to that containing the root nodule organisms, but free from the organisms themselves.

The general plan of the experiments was as follows:—

SECTION I.—*Laboratory experiments with sterilised soil or sand.*

SECTION II.—*Pot cultures in unsterilised soils from various sources.*
These as a rule included not only ordinary cultivated soils, but also virgin soils, or soils which had not grown leguminous crops for many years.

SECTION III.—*Experiments in accord with actual agricultural or horticultural practice.*
These experiments varied from the inoculation of small garden plots to tests on a large scale in the field.

I.—LABORATORY EXPERIMENTS WITH STERILISED SOIL.

Eight centres reported on the results of these experiments, and taking all the results together there are about an equal number of cases in which an increase was recorded (in most cases estimated), and in which no results were observed.

The details of the principal results reported in this series of experiments are briefly as follows:—

Aberdeen.—Moore's cultures for Alsike clover, red clover, lucerne, beans, and peas: soil sterilised in dry oven from 350 deg. to 400 deg. F. Seeds inoculated.

Alsike and red clover, "equally luxuriant in inoculated and uninoculated pots." Lucerne, "rather better where it was untreated." Peas and beans, "rather more luxuriant in pots bearing inoculated seed."

Aberystwith.—Moore's culture for vetches: crop from inoculated pot, 7 lb.; crop from uninoculated pot, 5 lb.

Cambridge.—Moore's culture: good garden soil, partly sterilised by repeated exposure to steam at 212 deg. F. No increase produced by inoculation, nor were any nodules formed on the roots of the plants either with or without infection. The extract from a good garden soil also failed to produce nodules. The tests were carried out in duplicate.

Chelmsford.—Moore's cultures for beans, peas, and clover: good results were obtained by the inoculation of sterilised and unsterilised sand, but no difference was obtained by the inoculation of sterilised soil.

Kingston.—Moore's and Hiltner's cultures for peas, beans, clover, and vetches: sand and soil sterilised in the pots in an autoclave at 120-130 deg. C. for about one hour each. With each crop the soil and the sand were inoculated, inoculated seeds also were sown in soil and sand, results were compared with uninoculated pots and with uninoculated pots manured with combined nitrogen, and in the case of clover and vetches, with pots inoculated with crushed healthy nodules. All pots were manured with a dilute manurial solution containing all the elements of plant food, with the exception of combined nitrogen. Combined nitrogen was added to one set of uninoculated pots. Pure, almost sterile, distilled water was used throughout the experiments. The plants were kept in trucks in a greenhouse built for the purpose of experiments on nitrogen assimilation, with a grant from the Royal Society. When fine, they were run into the open garden during the day.

The results were as follows:—In the pots of sterilised soil, the yield of the pots containing combined nitrogen was little better than that of the uninoculated pots without nitrogen, showing that the soil in the latter contained almost enough nitrogen. The increase in the air-dried crops only amounted to 2·6 grams in the case of the beans and peas, this being 6·5 and 10·4 per cent. increase in each case. The inoculation with either culture failed to produce any increase over the uninoculated pots, the yields of total air-dried crop being less in every case. A few nodules were, however, produced with Hiltner's cultures.

Much more marked were the results obtained in sterile sand, the peas (see Fig. 3), vetches and red clover all showing similar results.

The early formation of nodules was about in the same proportion, Moore's cultures being behind Hiltner's in this respect.

The air-dried peas per pot weighed in grams (Figure 3):—

Peas: Sand, no inoculation (*c*)—

Seed	1·51 grams	} =	3·31 grams.
Pods and stems	1·80 ,,		

Peas: Sand with ammonium nitrate (*d*)—

Seed	6·5 grams	} =	15·16 ,,
Pods and stems	8·66 ,,		

Peas: Sand inoculated with Hiltner's culture (*a*)—

Seed	9·31 grams	} =	14·91 ,,
Pods and stems	5·60 ,,		

Peas: Sand inoculated with Moore's culture (*f*)—

Seed	5·98 grams	} =	10·50 ,,
Pods and stems	4·52 ,,		

Beans in sterile sand did not produce such good results, and though a few nodules were formed on those inoculated with Hiltner's culture, none were formed on the roots of those inoculated with Moore's culture.

Woburn.—Hiltner's cultures for peas, beans, tares, and red clover; and Moore's cultures for *Melilotus* and soy bean: soil light sandy loam, sterilised by heating for six hours in a copper with water raised to boiling temperature, soil then drained, dried and sieved, and filled into earthenware pots.

The seed was inoculated, and duplicate pots compared with duplicate uninoculated pots. The seed was kept in the inoculating preparation for forty-five minutes in the dark.

In the pot experiments, twelve seeds were sown per pot for all the crops except *Melilotus*, of which twenty-two seeds per pot were planted. The dates of sowing were:—Peas and beans, April 3rd; tares and clover, April 17th; soy bean, April 22nd; *Melilotus*, April 29th.

By May 25th, peas and beans looked well, and at first the treated seed appeared better, the foliage having a darker colour; this difference, however, soon passed off. On June 8th, the plants were thinned to six per pot. The superfluous bean plants thus removed were washed and photographed. The photographs showed, however, practically no difference between the treated and untreated seed, and it was remarkable that plants in sterilised soil, and showing no nodules on the roots, had made such good growth. A similar result was obtained with tares.

In the case of the *Melilotus* the advantage which was distinctly seen as the result of the treatment when grown in

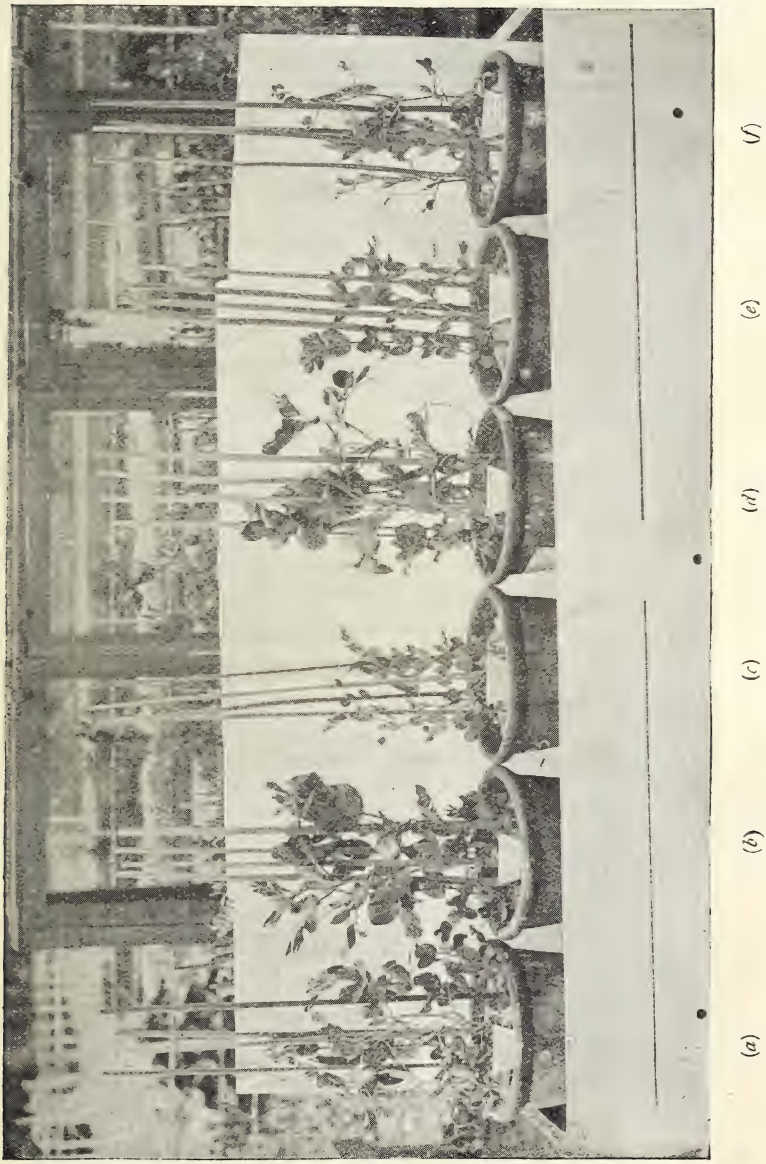


FIG. 3.—POT EXPERIMENTS WITH PEAS AT KINGSTON.

(*a*) Sand incculated with Hiltner's culture; (*b*) Seed inoculated with Hiltner's culture; (*c*) Sand, no inoculation, no nitrates; (*a*) Sand, manured with nitrates, sterilised; (*e*) Seed inoculated with Moore's culture; (*f*) Sand inoculated with Moore's culture.

poor soil, in good soil and in the open, was not apparent in the sterilised soil.

The results are given in the table below. The mean is taken of the duplicate pots in each case.

STERILISED SOIL.

Crop.	Weight of grain in grams.	Weight of straw in grams.	Percentage of untreated Grain.	Percentage of untreated Straw.
I.—PEAS: German preparation—				
Not treated	16·03	38·07	100	100
Treated	17·75	39·67	110	104
II.—BEANS: German preparation—				
Not treated	25·61	65·99	100	100
Treated	25·22	62·72	98	95
III.—TARES: German preparation—				
Not treated	37·26	44·52	100	100
Treated	32·53	39·43	87	88

Crop.	Weight of green crop, grams.	Percentage of untreated.
IV.—RED CLOVER: German preparation (first cutting)—		
Not treated	74·02	100
Treated	88·40	119
V.—MELILOTUS: American preparation—		
Not treated	25·50	100
Treated	25·29	99

Wye.—Moore's culture: in pots of steamed sand the growth of the various leguminous plants, whether inoculated or uninoculated, was the same.

II.—POT CULTURES IN VARIOUS UNSTERILISED SOILS.

Reports of experiments were received from seven centres.

Two principal types of soil were selected for these experiments:—(*b*) Soils from fertile fields or gardens; (*c*) soils that had either never been cultivated, or had not grown leguminous crops for many years. In this series also a large number of negative results are reported, and about an equal number of positive results from the inoculation. The preparations used in all but two cases were Moore's cultures.

The following are the principal results:—

Aberdeen.—Moore's cultures for Alsike, red clover, lucerne,

beans, and peas: the soils were (*b*) soil taken from a field in which the same germs and species of plant had been grown in 1904; (*c*) soil from a plot on which potatoes, and potatoes only, had been grown for twenty to thirty years.

Alsike and red clover were equally luxuriant on both soils, with and without inoculation. Lucerne gave a much better crop with inoculation than without in soil (*b*), but both pots failed on soil (*c*)—the potato soil. Peas, however, grew equally well on this soil (*c*), with and without inoculation; but in the soil (*b*) inoculation gave positive results. Beans benefited slightly from inoculation in both soils.

Bangor.—Moore's cultures for peas and clover: there was some little difference for a time in favour of plants grown from inoculated seed in soil taken from a mountain side. Experiments in fertile soil showed no difference.

Cambridge.—Moore's cultures gave negative results in pots of garden soil, poor clay subsoil, and soil from an old wood in which no leguminosæ can have grown for many years. Nodules formed abundantly, both when untreated and when inoculated. All the tests were made in duplicate.

Chelmsford.—Moore's cultures for beans, peas, and clover gave no result from inoculation of plants growing in pots containing a garden soil, a field soil, and a soil from Galleywood Common.

Edinburgh.—Moore's cultures gave negative results in pots of garden soil on which no leguminous crop had been grown for probably forty years.

Kingston.—Moore's and Hiltner's cultures for peas and beans: pot cultures in a black soil from a wood which had not been cultivated for many years, and in a fertile garden soil. Series the same as in sterilised pots.

The results were as follows:—The uncultivated soil gave negative results with beans, but a decided increase with peas, both with Moore's and Hiltner's cultures, the yield of air-dried plants in one case (seed dressed with Moore's culture), being greater than the yield from the completely manured pot. In fertile garden soil the yield from pots of beans was greatly increased by the inoculation.

The weights in grams of air-dried plants were as follows:—

Beans grown in garden soil manured without nitrogen, no inoculation—
Seed ... ... 25·76 grams
Stems and pods ... ... 21·37 ,, } = 47·13 grams.

Beans with nitrogren as ammonium nitrate—
Seed ... ... 28·15 grams
Stems and pods ... ... 16·05 ,, } = 44·20 ,,

Beans in soil inoculated with 1 c.c. of Hiltner's culture—
Seed ... ... 31·25 grams
Stems and pods ... ... 21·35 ,, } = 52·60 ,,

Beans in soil, seed inoculated with Moore's culture—
Seed ... ... 31·455 grams
Stems and pods ... ... 20·57 ,, } = 52·025 ,,

Newcastle.—Moore's cultures for Alsike, and Hiltner's for vetches: ordinary cultivated soil and moorland soil. Soil inoculated and seed inoculated in each set. Culture made no difference in crop with either Alsike or vetches on cultivated soil. On moorland soil, slight advantage in favour of inoculated soil with Alsike, but none whatever with vetches. There was no clear proof, in the case of the Alsike, that the advantage was due to the culture.

Woburn.—Hiltner's cultures, for peas, beans, tares, and red clover, and Moore's cultures for *Melilotus* and soy bean.

Soils: (*b*) a poor soil that had not borne leguminous crops for at least twenty years; (*c*) a good fertile soil. The soils were not sterilised, but otherwise the treatment and times of sowing were the same as in the case of the sterilised soil (see above). The result is shown by the following figures, which are the means of duplicate pots:—

Crop.	Weight of grain in grams.	Weight of straw in grams.	Percentage of untreated Grain.	Straw.
—PEAS (German culture)—				
(*b*) *Poor Soil*—Not treated ...	17·48	24·79	100	100
Treated	17·71	29·37	101	118
(*c*) *Good Soil*—Not treated ...	25·98	35·21	100	100
Treated	25·03	24·66	96	70
II.—BEANS (German culture)—				
(*b*) *Poor Soil*—Not treated ...	35·03	48·03	100	100
Treated	40·22	53·74	114	112
(*c*) *Good Soil*—Not treated ...	45·48	74·88	100	100
Treated	47·40	71·09	104	94
III.—TARES (German culture)—				
(*b*) *Poor Soil*—Not treated ...	29·37	33·57	100	100
Treated	28·82	35·30	98	104
(*c*) *Good Soil*—Not treated ...	39·17	52·72	100	100
Treated	32·97	56·02	84	106

Crop.	Weight of green crop, grams.	Percentage of untreated.
IV.—RED CLOVER (German culture) first cutting—		
(*b*) *Poor Soil*—Not treated	64·85	100
Treated	53·28	82
(*c*) *Good Soil*—Not treated	84·06	100
Treated	83·13	98
V.—MELILOTUS (American culture)—		
(*b*) *Poor Soil*—Not treated	17·18	100
Treated	21·08	123
(*c*) *Good Soil*—Not treated	25·90	100
Treated	30·37	117

Dr. Voelcker observes that the *Melilotus* was the one case in which an advantage was distinctly seen as the result of treatment.

III.—CROPS GROWN IN THE OPEN GROUND.

These were grown either (*a*) in small field or garden plots, or (*b*) in accordance with actual agricultural practice. It is to these experiments mainly that one must look for an indication of the practical value of these inoculating preparations to farmers in this country. Reports have been sent in from thirteen centres, on experiments conducted on some forty-five farms in different parts of England, Scotland, and Wales.

The results are as follows:—

Aberdeen.—(*a*) Garden plots 6 ft. × 11 ft.

Soil fairly fertile loam in good condition; turnips and oats were grown in two previous years. No manure was given to plots. Moore's culture was used.

The yield of Alsike and red clover indicated failure of inoculation on these crops. The effect of inoculation on beans, peas, and lucerne was distinct and quite appreciable to the casual observer. The difference is indicated by the weights of green produce:—

Beans inoculated	130 lb.
,, uninoculated...	122 ,,
Peas inoculated	57 ,,
,, uninoculated	52 ,,
Lucerne inoculated...	$7\frac{1}{4}$,,
,, uninoculated	$5\frac{5}{8}$,,

The difference in weight is less than might reasonably have been expected from the appearance of the crops.

(*b*) Field tests.—Twelve farmers on whose land clover sometimes failed to grow, or never grew freely, were presented with

3 lb. of red clover and 2 lb. of Alsike. Each lot of seed was contained in two equal packets, No. 1 packet of which had been inoculated with Moore's culture; No. 2 packet was from the same bulk, but untreated. The treated seed was added to the ordinary mixture of grass used on the farm, and sown on one acre. The untreated seed was applied on equal terms to the adjoining acre. The mixture of grass and clover seeds were sown with a grain crop, and the reports received from the farmers refer to the appearance of the clovers in the grain stubble.

On eight of the farms no distinction can be made between the treated and untreated clovers. On the other four farms the results have been favourable to the inoculation.

On one farm a slight difference is seen in favour of the treated seed. On a second farm, "No. 1 (the dressed seed) has the advantage in thickness and strength to a slight extent." On a third farm there are a few sickly clover plants on the inoculated acre, but no clover at all on the adjoining area untreated.

On the fourth farm, where the soil is peaty, and clover had never grown well, the treatment has been remarkably successful, producing a thicker covering of clover and a much stronger growth. The difference has increased between October and the present time in an extraordinary way.

Aberystwith.—(*a*) Plots measuring 15 sq. yards. Poor soil which had grown oats the year before. Crop, vetches, on the inoculated plot weighed 28 lb. Crop on the uninoculated plot weighed 25 lb.

Cambridge.—(*b*) Field experiments with peas and trifolium. Plots measured two widths of a corn drill, about one-eighth of an acre, right across the field. The soil was a light loam. Duplicate plots were sown. Hiltner's and Moore's cultures were used.

The seed for the check plots was soaked with pure water. The untreated peas were first sown. The drill was taken to pieces and scalded out with boiling water after sowing the seeds dressed with the American culture, and before sowing those dressed with the German culture. Strips of mangels 12 ft. wide separated the plots. The trifolium experiments were carried out in the same way, except that the seed was sown broadcast.

The observations made during the growth of the plants and

confirmed by the weights of the harvested peas showed no beneficial results to have accrued from the inoculation.

Chelmsford.—American inoculating material used in field trials on beans. No beneficial results were obtained with the inoculated plots over the uninoculated, as shown by observation and yield of seed.

In experiments with French beans, of plots ·465 of an acre each, the following results were obtained :—

	Bush.	Pt.
Dressed beans, per acre	26	2
Undressed beans	26	$1\frac{3}{4}$

Edinburgh.—(*a*) Garden plots. Two favourable reports and many negative with Moore's culture.

Glasgow.—Experiments with Moore's and Hiltner's cultures on some twelve farms.

Moore's cultures for lucerne on one farm in Renfrewshire showed no difference between inoculated and uninoculated plots. In two experiments with red clover, one in Renfrewshire and one in Lanarkshire, the results were entirely negative with Moore's culture.

Dr. Hiltner's culture applied to a lucerne crop on the Central Experiment Station, near Kilmarnock, which had been sown in the previous year, produced a very striking and remarkable effect on the crop there.

The table on page 655 shows the results obtained with beans inoculated with Moore's culture on eight farms. Comparing the untreated plots, No. 1 column, with the inoculated plots, No. 2 column, manured in the same way, an increase is seen in five out of the eight plots ; in the case of Woodilee, it amounts to a gain in grain of 30 per cent. on the similarly manured uninoculated plot. The 1 cwt. of nitrate does not appear to have been able to serve the plant nearly so well, producing an actual falling off in the yield in this case.

Kingston.—(*a*) Five experiments were made in garden plots with peas and three with beans, part of the rows being dressed with Hiltner's cultures and part with Moore's. In one case only the peas inoculated with Hiltner's culture looked better during the early stages of growth than the undressed peas. In all the other cases the dressing was without visible effect.

(*b*) Experiment in accordance with actual agricultural practice.

Beans dressed with Moore's culture on one farm, and peas dressed with Moore's culture for one plot and Hiltner's for another, produced no visible increase over undressed plots. The roots of all the plants were well covered with nodules. A sack of peas was dressed for each plot, and it was found quite easy to dress them by the method previously mentioned.

Another experiment was conducted at Diseworth, in Leicestershire, on a heavy clay soil which had not been used for peas for very many years. On March 25th, a fresh culture of Moore's inoculating material was used for dressing peas for a half-acre plot, an equal weight of untreated peas being sown on another half-acre plot. At a very early stage the dressed plot showed more healthy and finer plants than the undressed. The peas in the undressed plot were suffering from disease. When the peas were threshed in November, it was found that the crop from the dressed plot weighed 108 stones, while that from the undressed weighed only 66 stones.

Leeds.—Field plots with clover from different countries sown in oats at Manor Farm, Garforth.

Each plot was divided into three parts, the seed for one was dressed with Hiltner's cultures, for another with Moore's cultures, while in the third case the seed was untreated.

The quantity of seed sown on each of the thirty-nine plots was so adjusted that each plot received an equal number of germinating seeds. The seeds were soaked in clean sterilised germinating dishes containing the respective culture fluids for about two hours on April 14th, 1905. The seed was considered to be too wet for sowing uniformly, and clean white sand was therefore mixed with each dish of seed till the excess moisture was taken up, the sand and seed being thoroughly mixed. On April 15th, when the sand and seed were dry enough, the sowing was made by hand, with precautions to prevent the organisms being carried from one plot to another.

On August 21st, after the oat crop was harvested, the clovers were inspected by Dr. Smith. The general result observed was that the uninoculated plots of all the thirteen varieties were better than the inoculated plots. Better results were obtained from the American cultures than from the German cultures, except in the case of two varieties.

On December 7th, the plots were again examined, and a

GLASGOW BEAN EXPERIMENTS, 1905 (SEE P. 653).

Name of farm.	Untreated. 6 cwt. superphosphate. 2 cwt. sulphate of potash. Weight per acre. Grain.	Straw.			Inoculated with American material. 6 cwt. superphosphate. 2 cwt. sulphate of potash. Weight per acre. Grain.	Straw.			Untreated. 6 cwt. superphosphate. 2 cwt. sulphate of potash. 1 cwt. nitrate of soda. Weight per acre. Grain.	Straw.			Result of inoculation.
	Lb.	Tons.	Cwt.	Qrs.	Lb.	Tons.	Cwt.	Qrs.	Lb.	Tons.	Cwt.	Qrs.	
Burnbank	1,530	1	6	3	1,790	1	6	3	1,760	1	0	0	+
Townhead	3,330	3	15	0	3,250	3	15	1	3,390	3	16	2	−
Netherwood	1,800	0	13	3	2,040	0	16	3	2,320	0	19	2	+
Holmes Farm	4,170	1	15	3	3,800	1	11	3	3,900	1	13	0	−
Hill of Drip	2,400	1	7	2	2,520	1	10	0	2,350	1	7	2	+
Overton	4,220	1	5	1	4,410	1	13	0	4,750	1	13	2	+
Woodilee	2,360	0	18	0	3,070	1	2	2	1,800	0	14	3	+
West Leys	1,900	—	—	—	1,900	—	—	—	1,960	—	—	—	Straw not weighed.

WOBURN EXPERIMENTS (SEE P. 656).

Crop :—	Peas.						Beans.						Melilotus.	
Culture used :—	Hiltner's.						Hiltner's.						Moore's.	
—	Weight of grain.		Weight of straw.		Percentage of untreated. Grain.	Straw.	Weight of grain.		Weight of straw.		Percentage of untreated. Grain.	Straw.	Weight of green crop.	Percentage of untreated.
	Lb.	Ozs.	Lb.	Ozs.			Lb.	Ozs.	Lb.	Ozs.			Lb.	
Not treated	1	11½	2	8	100	100	2	12	5	0	100	100	18½	100
Treated ...	1	15	3	4	112	130	2	2½	4	6	77	87	25¼	136

distinct improvement was noted in the dressed plots. The plots sown with seed dressed with Moore's cultures had grown better than the uninoculated in five out of thirteen varieties of red clover, and the Hiltner plots had also grown better in five out of thirteen varieties.

Comparing the two dressed plots, Moore's plots were better than Hiltner's in five varieties; Hiltner's were better than Moore's in four varieties. The two were equal in four varieties.

Newcastle.—Field experiments at Cockle Park. Plots $\frac{1}{323}$rd. of an acre. Sown May 6th. Harvested August 31st to October Moore's cultures were used.

Crop.	Alsike green crop.	Beans.				Peas.			
		Grain.		Straw.		Grain.		Straw.	
	Lb.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
Plot 1—Untreated	1	2	1	4	13	2	14	3	10
Plot 2—Seed inoculated ...	1	2	8	5	0	3	8	3	0
Plot 3—Soil inoculated ...	1½	2	9	5	4	3	6	3	0

Plots of the three crops in the college garden all gave negative results.

Reading.—No appreciable differences were noted between plots of lucerne and red clover inoculated with Moore's cultures and uninoculated plots.

Woburn.—Plots in the open near the Woburn Pot-Culture Station were used, the dates of sowing and inoculation of the seed being the same as in Section I. Four hundred seeds of each kind were sown except in the case of *Melilotus*, of which 1,222 seeds were used.

The results obtained at harvest are shown in the table on page 655.

Wye.—In the field the inoculation with Moore's cultures produced no results superior to those obtained on the check plots.

SUMMARY AND CONCLUSIONS.

The results obtained in Section I. of this report, viz.:—*Laboratory Experiments in Sterilised Soil or Sand*, should answer the question: Can these cultures produce healthy

nodules, and consequent increased growth, on plants growing in soils deficient in combined nitrogen and altogether free from the organisms producing nodules on the roots of the crop under experiment ?

If these conditions did actually exist, as shown by the blank pots growing plants free from nodules and starved for want of nitrogen (for the fact must not be lost sight of that leguminous plants can grow to perfection without nodules and entirely at the expense of the combined nitrogen in the soil), it still has to be shown that the soil was in such a condition that the nodule organism when added could exist until such time as it would be able to enter the root hairs of the young plant. This could be shown (1) by positive results ; (2) by the inoculation of the soil with the washings of a fertile soil in which the nodule required was always produced ; or (3) by inoculation of a pot with the crushed healthy nodule of another plant similar to the one under experiment ; a method which a large number of experiments has proved never to fail when the soil is suitable for the existence of the organism.

It is very difficult, if not impossible, to find a natural soil in which no nodules are produced on the roots of a leguminous plant, for if the organism adapted for the plant in question happens to be absent, others of the same species, as Buhlert has shown (Centralblatt f. Bakt., Zweite Abteilung, Vol. IX., 1902, pp. 148–226) will slowly adapt themselves to the plant in question. Hence the necessity of sterilising the soils before use. Here another difficulty arises, for an ordinary soil which contains some 2,000,000 organisms per gram in a well-balanced condition, is completely altered by sterilisation, after which, as some of the experiments showed, it will grow a luxuriant, unbalanced, bacterial flora, which cannot fail to be without direct or indirect action on plant and inoculated organism alike. For the above reasons sterilised quartz sand was also taken for many of the experiments ; but here again it may be urged that insufficient organic food was supplied for the needs of the organism, or that the necessary manurial treatment was not suitable for its requirements.

Granted that all these conditions in the reported experiments were at least as suitable for the production of nodules as those which occur in nature, there still remains the question of the

cultures themselves, variations in which are quite sufficient to account for the conflicting results obtained. The organism is believed to be incapable of forming spores (the resting stage) and the wonder is, not that so many of the American cultures should have failed, but that the organism should have been capable of living for so long on cotton-wool, as many of the experiments have proved to be the case.

It seems probable from the luxuriant growth obtained in many of the uninoculated pots that the quantity of available combined nitrogen present was large; in some cases large enough for the requirements of the plant, and so no beneficial results could be expected from the inoculation. The production of nodules also would have been retarded.

The occasional injurious results produced by soaking the seeds, reported in some cases, may have been responsible for some of the instances in which a smaller yield was obtained with the treated seed; a point which could only be elucidated by dressing the seed for the untreated pots with a similar solution, but free from the organisms of the root nodules. It seems also probable that in some cases Moore's cultures were dead, or in a highly weakened condition.

The experiments in which positive results were obtained show that in many cases both Moore's and Hiltner's cultures were alive, and capable of infecting the plants for which they were designed and producing an increased yield.

The results obtained in Section 2.—*Pot cultures in various unsterilised soils* should show in the case of sub-section (*b*) (soils from fertile fields) whether the preparations are capable of increasing the production of nodules and giving a greater yield in soils which already contain, or are supposed to contain, a large number of nodule-forming organisms: the conditions remaining the same as those in which the first scientific proof of the preparations was made, and in which outside influences were, as far as possible, eliminated. In sub-section (*c*) soils were selected which were considered least likely to contain the required organism, and in which, consequently, the greatest effect might be looked for as a result of the inoculation. In both cases combined nitrogen was likely to be present in considerable quantities. The age and previously proved inefficiency of some

of the cultures accounts for many of the negative results. The results indicate that even where the nodule-forming organism is present considerable increase is sometimes produced, as in the case of the lucerne, peas, and beans in pots of fertile soil at Aberdeen, and in that of beans in fertile garden soil at Kingston. Some of the virgin soils were rich in combined nitrogen, but at Woburn with *Melilotus*, a crop new to the soil, Dr. Voelcker reports a distinct gain due to inoculation, while in this same poor soil beans showed an increased yield in the pots inoculated with Hiltner's cultures.

The third series of experiments should indicate the extent to which these cultures are likely to be of practical value in this country. The negative results exceed the positive in number, both in plot experiments and under agricultural conditions.

There are, however, some cases in which a considerable gain resulted from inoculation. Such, for example, are the bean, pea, and lucerne plots at Aberdeen ; the clover on peaty soil near Aberdeen ; beans at Woodilee, reported in the Glasgow experiments ; the peas at Diseworth, reported in the Kingston results ; and the *Melilotus* at Woburn ; all of which were obtained with American cultures.

Very few experiments were tried with Hiltner's cultures, but the lucerne at Kilmarnock gave very satisfactory results.

As a result of all the reported experiments, it seems evident that the cultures used were not uniform ; it is not possible, however, to determine the extent to which the failures are to be attributed to this cause. It seems, however, from the positive results recorded, that not only are these cultures sometimes able to produce nodules on the roots of plants new to a neighbourhood, but that even in cases where the leguminous crop had been grown in the previous year benefit may be derived from inoculation.

It is quite evident that the subject of plant inoculation in this country has not yet passed the experimental stage, and more work is required before one can feel at all justified in recommending either method for adoption on a field scale ; nevertheless, the positive results obtained may lead farmers to hope that in the future benefit may be derived, in some instances at least, from the treatment of the soil or the seed before sowing, with inoculating materials preparatory to growing leguminous crops.

SPRAYING MIXTURES.

At the opening of the new spraying season it may be of some advantage to call attention to a point connected with the operation which hitherto has been strangely neglected. That point is the suitability or unsuitability for mixing of various materials used in spraying. Fruit-growers and managers of spraying experiments not infrequently mix materials without any consideration of the chemical reaction which may take place between two or more of them. In combining insecticides and fungicides there is, of course, a desire to battle with the two classes of fruit pests in one operation ; but if the materials chosen for this double purpose will decompose each other and enter into fresh combinations, it is important to consider what those combinations will be, whether they will be harmful or inert, and whether they will be mechanically objectionable on account of the difficulty of passing the mixture through the nozzles of a spraying machine.

Extremely few fruit-spraying trials have been made in this country, but they have been numerous in the United States, and it was the practice of mixing materials in that country which led me to make some inquiries as to the effects of such mixing, and as to mixtures which seemed worth trying if they could be used without decomposing the effective elements.

Some mixings cause partial decomposition of constituents, and yet leave them apparently effective. A notable example is the combination of Paris green and Bordeaux mixture. Messrs. Blundell, Spence and Co., manufacturers of Paris green, state that the addition of Bordeaux mixture to it decomposes the Paris green, producing a much less poisonous and efficient combination of the copper and the arsenic. But it is partly for the purpose of reducing the poisonous action of Paris green that the addition of Bordeaux mixture to it is commonly recommended and practised in the United States. The mixture has stood the trial of prolonged experience, and its effectiveness as an insecticide and fungicide combined has been demonstrated in numerous experiments. The objection to it, as to Paris green alone, is that it often seriously injures the foliage of fruit trees, even when used in such moderate proportions as 8 oz. of Paris

green with Bordeaux mixture containing 8 lb. of sulphate of copper to 100 gallons of water. The use of lime with Paris green to neutralise its action upon foliage is also commonly recommended; but this probably decomposes the poison to a much greater extent than does the Bordeaux mixture.

In consequence of the injurious action of Paris green upon foliage in a tender stage, the use of arsenate of lead is becoming more and more common as a substitute. As this poison is quite harmless to foliage, it is a pity that it cannot be mixed with either of the two ordinary fungicides without losing its efficiency. Dr. Dyer was consulted upon the point, and he stated that if arsenate of lead were mixed with Bordeaux mixture, the lead, by the action of the sulphate of copper, would be converted into ineffective sulphate of lead. Similarly, if potassium sulphide as a fungicide, instead of the Bordeaux mixture, were mixed with arsenate of lead, the result would be the formation of ineffective sulphide of lead and comparatively useless potassium arsenate or potassium sulpharsenate. Again, the mixing of Paris green and potassium sulphide would lead to the conversion of the copper in the former into useless copper sulphide, leaving only the arsenic to be relied on as a poison. In this case apparently the fungicide would be the agent rendered ineffective, while the insecticide would still retain considerable virulence.

For two seasons some extensive spraying experiments have been carried on by the authorities of one of the principal experiment stations in the United States, in which Bordeaux mixture and arsenate of lead have been combined for the purposes, mainly, of checking attacks of the Codlin moth caterpillar and scab in apples and pears. The constituents were 10 lb. of copper sulphate, 7 lb. to 10 lb. of lime, and 3 lb. of lead arsenate to 100 gallons of water. The trees were sprayed three times, and the results were decreases of both attacks, but not to a nearly sufficient extent to be regarded as satisfactory. No doubt the explanation is the impairment of the constituents in the way described by Dr. Dyer. As Paris green had proved harmful to foliage, the arsenate of lead was used instead, apparently without any consideration of possible decomposition. There is nothing unusual in this neglect of an important consideration. In all the numerous reports from American experi-

ment stations relating to spraying that I have read, not one has entered into the subject of the effect of mixing spraying materials from the point of view of possible decomposition. It is not surprising, then, that in the numerous pamphlets on spraying issued in the United States, chiefly by manufacturers of spraying machines, the point in question is ignored; and the most incongruous mixtures are commonly to be found among the prescriptions.

It appears that a combination of Paris green and Bordeaux mixture, in spite of the partial decomposition of the former, remains the most effective combination of an insecticide and a fungicide used at present, for which purpose it was recommended in this *Journal* for April, 1905. For the first application, just before the buds open, it would be harmless to the trees; but if applied immediately after the blossom has fallen, when it is most needed for the destruction of the Codlin moth caterpillar, my experience in last season's operations induces me to advise that only 6 oz. instead of the usual 8 oz. per 100 gallons should be used, because the foliage is then in a tender stage. The use of 8 oz., with Bordeaux mixture, at this stage, greatly injured the foliage of my apples and plums. That the Paris green was the cause of the injury was proved by precise trials on trees not previously sprayed, a branch on each of several apple trees being treated with Paris green at the rate of 8 oz. to 100 gallons, other branches on different trees with Bordeaux and Paris green, and a third set with Bordeaux alone. Each branch was labelled in reference to its treatment, and it was found that the Bordeaux mixture alone had no injurious effect whatever upon the foliage, whereas each of the other applications caused scorching and ultimate defoliation. In this experiment, it must be explained, the spraying was done with a garden syringe, and the foliage was more nearly drenched than it would have been by a spraying machine with fine nozzles. But it is almost impossible to prevent men who do spraying work from drenching the trees. They are not satisfied with covering the foliage with a fine mist of spray, which is all that is required, and, unless constantly superintended, they keep on spraying a tree till the stuff drips off the leaves.

The third spraying, often necessary to poison the food of

leaf-eating caterpillars and to check scab in apples and pears or leaf-blight in plums, is done when the foliage is better able to withstand the effect of Paris green than it is in its half-developed stage. It is much to be regretted, however, that no fungicide has been discovered which will mix harmlessly with lead arsenate. As there is none available, it may be suggested that, in spraying against the Codlin moth, just after the blossom has fallen from apple trees, arsenate of lead alone should be used. Then, if scab be apprehended, Bordeaux mixture can be applied a few days later.

Where Codlin moth is not troublesome, a combination, which is at once about the most effective against the apple-sucker and the aphis and a check to scab in apples and pears and leaf-blight in plums, is fortunately not liable to cause decomposition. This is a mixture of quassia, soft soap, and potassium sulphide. As the two former ingredients, liberally used, proved strong enough to kill the saw-fly caterpillar on gooseberry bushes last season, completely clearing the infested bushes, they would be equally effective against other leaf-eating caterpillars, at least if the pests were sprayed when young. This mixture would not poison the food of the pests, as Paris green or lead arsenate does, and therefore it would act only upon broods existing at the time of spraying. But in many plantations apple-suckers and aphides on apple trees, and the latter on plums, are much more destructive than any caterpillars, and in such cases this unobjectionable mixture is strongly to be recommended. The strength which proved effective against saw-fly caterpillars was one of 12 lb. of quassia chips and 12 lb. of soft soap to 100 gallons of water. The chips were boiled for an hour in twelve gallons of water with half the soft soap, and after the liquid had been drawn off, the same chips were boiled again with the other half of the soft soap, and the two decoctions were mixed and diluted. To this mixture 6 lb. of potassium sulphide, after being separately dissolved, should be added as a fungicide. If applied just before the leaf-buds on apples and plums open, it may do much to prevent apple-suckers and aphides from harbouring on the trees where they are hatched, and possibly to check scab and leaf-blight. The operation may be repeated after the blossom has fallen for the same purposes. The two

insect pests by that time will be showing on the trees, if they are to appear at all. Many young caterpillars also will be killed by this spraying.

If, in spite of the operations just described, leaf-eating caterpillars are found to be infesting the trees, spraying with arsenate of lead, 3 lb. to 100 gallons of water, may be necessary; or if scab is persistent on apples and pears, or leaf-blight on plums treatment with Bordeaux mixture will be beneficial.

Prescriptions for the preparation of lead arsenate differ slightly in proportions of constituents. Dr. Dyer states that 1 lb. of dry arsenate of soda to 3 lb. of acetate of lead would make tribasic arsenate of lead, the actual quantity of which would be 2⅓ lb. Both constituents should be of 98 per cent. purity. They should be dissolved separately and mixed well. Similarly, the quantity of arsenate of lead to 100 gallons of water varies in different recipes. A Bulletin from Cornell University says 2 lb. to 8 lb. Another prescription says 2 lb. "or even more, as it does not hurt the foliage." An excessive quantity of the poison is wasteful; but, on the other hand, the probable explanation of arsenate of lead having proved less effective than Paris green in some cases, according to reports of fruit-growers, is that it has been too much diluted. This poison was first recommended for use in spraying in 1892 by Mr. F. C. Moulton, an American chemist. When first tested, such weak solutions as 6 oz. to 8 oz. to 100 gallons of water failed to kill caterpillars quickly, while 1 lb. to 1½ lb. were regarded as satisfactory. No injury to apple foliage occurred in a trial of 16 lb. of arsenate of lead to 100 gallons, but 3 lb. would be ample, and as that quantity has been used in many trials recently, it may be recommended. To make this quantity, according to the formula given above, 3¾ lb. of acetate of lead and 1¼ lb. of arsenate of soda would be required.

In the article in the *Journal* for April, 1905, already referred to, the difficulty of spraying with lime, sulphur, and soft soap, to prevent birds from devouring the buds of gooseberries, was noticed. This is one of the combinations which do not make suitable spray-liquids, as a flaky soap of lime is formed, while the sulphur also is brought out of such combination with the lime as it had made by being added in thin layers while

successive layers of lime were slaked, or by being boiled with the lime. The same objectionable conditions resulted from the addition of soft soap to calcium sulphide properly prepared by a manufacturing chemist. Therefore, potassium sulphide and soft soap, which combine well, making an excellent spraying fluid, with some other preparations, were tried last season, unsprayed bushes being left as checks. The experiments proved futile, however, as unsprayed and sprayed bushes alike were untouched by birds in the winter of 1904-5, possibly because it was an exceptionally mild one. The lime, sulphur, and soft soap spray appeared to have an invigorating effect upon the bushes, while cleansing their stems and older branches of moss and lichen.

This season a new combination has been used on gooseberry bushes, consisting of 60 lb. of lime, 30 lb. of flowers of sulphur, and 12 lb. of caustic soda to 100 gallons of water. It has been tried in two seasons in several orchards of apples, pears, plums, and peaches by the authorities of the New York Experiment Station to kill scale and to check scab, and otherwise to act as a caustic spray when buds are dormant. The sulphur is made into a paste, thinned gradually, poured over the quicklime, and mixed well with it while the latter is slaking, the caustic soda being added and well stirred in immediately afterwards. This is termed a self-boiling spray, and it makes an excellent mixture which, after being strained through fine brass wire gauze, passes freely through the nozzles of the spraying machine. It adheres well to the bushes.

In one of the apple orchards in New York State this spray is reported to have damaged seriously the leaf and blossom buds; but the branches of the trees, it is stated, were "repeatedly drenched" and "much oversprayed." In four other apple orchards no appreciable injury was done to the trees. The spray proved very effective for the destruction of scale, and considerably so in checking scab, while leaf-curl in peaches was almost entirely prevented by it. Why this preparation harmed apple buds, even when excessively sprayed, is unaccountable, unless they were too much advanced, as lime and sulphur appeared to invigorate gooseberry bushes, while the mischief is not attributable to the caustic soda, as it occurred also after

spraying with lime and sulphur boiled together, without any soda. But the spraying was done in April, which was probably too late in the season. Coating the buds over thickly with lime and sulphur just before the time of expansion may be easily imagined to be possibly injurious ; and it is stated that the buds were " well swollen " when the operation was performed. In the four orchards where no appreciable damage was done the spraying was probably much slighter.

In full confidence that this mixture will not harm entirely dormant leaf or blossom buds, it has been used this season on apples as well as gooseberries instead of the usual winter wash of caustic potash and soda, over which it appears to have some advantage, particularly as a partial preventive to scab. So far as personal experience indicates, the caustic potash and soda, used year after year as a spraying mixture in February, have no effect whatever as a preventive of scab, apple-sucker, or aphis, valuable though they are for cleansing the trunks and branches of the trees of moss, lichen, and American blight, and possibly for destroying hibernating insects and eggs. The attacks of the apple-sucker, the aphis, and scab could hardly have been worse than they have been where this spray has been used, while infestation by caterpillars has been slight, the Codlin moth larva being " conspicuous by its absence." It does not follow that the caustic spraying has been the cause of this immunity. In the New York State experiments the lime, sulphur, and caustic soda mixture was of no effect as a preventive to the Codlin moth. For that purpose it was followed by two sprayings with Bordeaux arsenical mixtures.

It is obvious that the spraying of fruit trees and bushes is at present in a crudely empirical stage, and that a great number of experiments more varied and precise than those which have been carried out hitherto require to be conducted before the practice will be placed upon a satisfactory basis. There is much to be learned as to the best insecticides and fungicides, the most effective strength of each compatible with safety in application to different fruits, the suitability of various materials for mixing, and the most appropriate seasons for operations desirable for various purposes.

WILLIAM E. BEAR.

Violet Root-Rot.

This disease (*Rhizoctonia violacea*) was recognised and described nearly two hundred years ago as the cause of serious injury to the saffron industry in France. It was also noted at the time that the disease attacked the roots of many other kinds of plants, both wild and cultivated. From this period it has not only continued its ravages, but has attacked in turn almost every new plant, excepting cereals, introduced to cultivation.

In this country *Rhizoctonia* has a special predilection for lucerne ; clover, carrots, beet, mangold and potatoes sometimes also suffer severely, and most frequently when they follow lucerne, which appears to attract the stray mycelium of the fungus present in the soil. The mycelium increases enormously in quantity on the root of this plant, and a large stock remains in the soil in a vigorous condition ready to attack any suitable host. If the following crop happens to be a cereal, which the fungus cannot feed upon, it attacks weeds of various kinds, and thus tides over the period until a crop suitable to its requirements is planted, when a fresh stock of mycelium is again left in the soil.

The disease is readily known by the bright colour of the mycelium of the fungus, which varies from rose with a tinge of purple to a deep brownish purple when old. The mycelium at first spreads as a delicate, much-branched network over the surface of the root or tuber, and finally forms dense patches, or covers the entire surface with a compact felt. The amount of injury caused by the fungus varies to a great extent on different plants. In the case of beet and carrots, the mycelium soon enters the fleshy root and destroys it. In lucerne and clover the active rootlets are killed, whereas in the case of potatoes the entire surface of the tuber may become covered with the fungus without sustaining injury, the mycelium being unable to penetrate the skin except through a wound. When once it is through the skin, however, the tuber is soon reduced to a pulp. As a rule the fungus confines its attacks to underground parts of the plant, but when the weather is continuously damp and dull the mycelium sometimes extends up the stem, and even passes on to the leaves and fruit.

So far as at present known the fungus does not form fruit

its only mode of reproduction being vegetative by means of mycelium.

The way in which the fungus spreads in the soil and keeps its hold can be easily seen. When a root or tuber has become superficially coated with a felt of mycelium, sclerotia or concentrated masses of mycelium of two distinct kinds of structure, and having different uses, are formed. Some sclerotia are of considerable size, varying from that of a pea to a hazel nut; these become free from the root when fully formed, and remain in the soil as centres of future infection. Other sclerotia, rarely exceeding the size of an ordinary pin's head, are usually produced in considerable numbers under the felt of mycelium, and in close contact with the root or tuber, to which they remain firmly attached, and are removed along with it. If such infected roots or tubers are eaten by some animal, the minute, compact sclerotia are not injured by passing through it, and by such means are often transported to new localities. In like manner new districts are often infected by means of minute sclerotia attached to potato tubers, carrots, &c. In some instances beans and peas are attacked while yet in the pod, and minute sclerotia are formed in the skin of the seed.

The disease usually spreads from a point of infection equally on every side, the mycelium gradually spreading through the soil from diseased to healthy plants.

The first sign of disease is the drooping and yellowing of the foliage; the presence of violet mycelium on the surface of a carefully removed root proves the fact.

The fungus can only develop in the presence of an acid, hence can be held in check by the free use of lime.

Good drainage and the prevention of sourness of the soil are essential features in combating the disease, as is also the absence of weeds, as these supply the main supply of food for the fungus when a cereal crop is present.

Care must be taken not to introduce the disease by means of small sclerotia adhering to seeds or tubers.

Seed obtained from dry, elevated districts should be selected.

(1) (2)

VIOLET ROOT-ROT.

1. ON LUCERNE ROOT.
2. ON POTATO TUBERS.

How Cereals are Infected with "Smut."

Smut is a very destructive fungus which in the case of cultivated cereals shows itself under the form of a black powdery mass in the ear. The grain is completely destroyed, its place being occupied by the fungus. Brefeld, a German mycologist, who has contributed so much to our knowledge respecting the fungi popularly known as "smuts" (*Ustilago*) and "bunts" (*Tilletia*), announced that infection could only be effected during the youngest seedling stage of the plant, such infection resulting from the presence of smut spores in the soil, or was more frequently due to spores adhering to the grain being sown along with it. The only known exception to this rule was maize, where infection was admitted to be possible at any point of the full-grown plant where young tissue was present.

This statement was generally accepted, and all remedial measures for the prevention of "smut" were based upon it.

It is true that from time to time various observers have stated that inoculation could be effected by dusting "smut" spores on the flowers of oats or barley. Such announcements, perhaps, did not receive the attention they deserved, but were promptly dismissed with a reference to Brefeld. The very fact of Brefeld's acknowledged authority thus for a time stifled further progress.

Quite recently, however, a series of experiments conducted with great care by Hecke, a German botanist, has definitely proved that the disease can be established by infecting the young ear with "smut" spores.

Ears of barley when in flower were moistened with water containing "smut" spores in suspension, and at a later stage of growth the mycelium was found to have penetrated into the embryo or young grain.

It follows that in future two distinct modes of infection have to be taken into consideration in dealing with "smut" disease in cereals: (1) Infection of the seedling by "smut" spores present in the soil. This method of infection is combated successfully by the well-known method of treating the "seed" with formalin or other fungicide just before sowing. (2) Infection by "smut" spores carried by wind alighting on the ear of corn

during the flowering stage. Plants that have been infected during the seedling stage can often be recognised by an expert by their more robust growth and darker green colour, the presence of the fungus in their tissues stimulating the plant to more active growth. As a result, such diseased plants are often taller than non-infected ones, and mature somewhat earlier, the "smut" spores being ripe and dispersed just at the time when uninfected plants are in flower.

No practical method suggests itself for the prevention of infection through the flowers.

A thorough reinvestigation of the whole subject of infection and transmission of "smut" disease in cereals must now be undertaken, as the recent discovery suggests certain possibilities or even probabilities.

Recent research has indicated that in the case of some of our most destructive diseases, mycelium of the fungus hibernating in the tissues of reproductive portions of plants is a more constant and certain method of perpetuating a disease than by means of spores. As examples: mycelium in the tuber causes potato blight and leaf-curl; in branches, causes peach leaf-curl; in rhizomes, curl disease of mint, "smut" in reeds, &c.; in seeds, the infected grain of various species of rye-grass, &c.

It has now to be definitely determined whether the mycelium formed in a barley grain always produces "smut" spores during the season of infection, or whether the mycelium remains passive until the seed is sown, when it would pass into the seedling, grow up along with it, and finally form spores in the grain.

The frequent appearance of a considerable percentage of "smutted" ears in a crop after the seed had been specially treated with a fungicide suggests the probability of some other means of perpetuating the disease than by infection of seedlings by spores present in the soil.

Suggestions for the prevention of "Bunt and Smut" are given in Leaflet No. 92, while references to the use of formalin as a preventive have appeared in this Journal, Vol. IX., p. 366, Dec., 1902; Vol. XI., p. 215, July, 1904; and to the effect of formalin and blue-stone on germination in Vol. XII., p. 289, August, 1905.

Degeneration of Potatoes.

An interesting example of the well-known tendency of varieties of potatoes to deteriorate after cultivation for a number of years is reported from Westphalia, in Germany.* In this Province it appears that the Magnum-Bonum potato has been the principal variety grown during the past twenty or twenty-five years, the demand for this sort and its consequent easy sale, combined with a satisfactory yield, preventing farmers from employing more modern varieties or considering the desirability of a change of seed. In 1905, however, the cultivation of the Magnum-Bonum was a failure in nearly the whole of the south-west of Westphalia. In the spring the growth in many fields, particularly on wet land, was very backward, with many gaps; in the summer the plant was backward in its development—in some places more, in some less—the stalks being weak and short and the leaves small. The fields, instead of having the usual appearance shortly before ripening time of a thick and luxuriant growth, looked as though they had been planted with different sorts—some with strong-growing haulms and some with weak. The haulm of the backward plants died a week to a fortnight earlier than that of the healthy plants.

When the crop was harvested, the diseased plants were found to have only a few small tubers. In most cases the old seed potatoes were not found shrivelled up and exhausted as when the growth is unchecked, but to have become strikingly larger. To what extent this apparent growth took place it is difficult to say, but many farmers considered the size doubled. In one case, where the seed-potatoes were carefully graded by a machine, an increase of from nearly one-half to three-quarters appeared to have taken place. The skin of these seed-potatoes had become rough and cracked, and the eyes which had not grown were shrivelled. When cut, the inside seemed of a vitreous nature, the surface being dirty white. Small cavities surrounded with rusty-coloured patches were found near the few eyes which had grown.

The diminution in the crop was considerable; enquiry amongst a large number of farmers showed that it varied from about

* *Deutsche Landwirtschaftliche Presse*, Nos. 91, 94, 95, 97, 1905.

5 per cent. to a complete failure, and averaged probably 50 to 60 per cent. Investigations that were made by Drs. Schleh and Spiekermann showed that there was no special cause of disease in this case, the failure being regarded as partly due to the meteorological conditions of 1904 and partly to a certain degeneration in the Magnum-Bonum. The summer of 1904, it may be remembered, was remarkable for the lack of rain which was experienced in July and August,* but if the failure of this crop is to be attributed solely to the unfavourable conditions to which the seed-potatoes were exposed, other varieties would presumably have been affected in like manner, but this does not seem to have been the case. Moreover, in several instances where Magnum-Bonum seed was purchased from another district, a successful crop was obtained, even where home-grown seed was a complete failure.

A number of other instances of failure were reported in other parts of Germany, the cause of which may, in all probability, be attributed to the continual use of home-grown seed, or of seed of the same variety grown in the district.

Improvement of Poor Pasture.

An experiment in the improvement of poor pasture in Ayrshire, extending over six years, from 1899 to 1904, has recently been brought to a close, and it is interesting to observe that so far as comparison is possible with the results obtained in somewhat similar experiments at Cockle Park, at Sevington in Hampshire, and Cransley in Northamptonshire, the lessons are precisely the same,† but in reporting on the experiment in question Professor Wright, of the West of Scotland Agricultural College, draws attention to several other points of considerable practical value.

Soil.—The area occupied by the experiment amounted to fifteen acres, divided into five plots. It had been in pasture for about eighty years, during which period no manures had been

* See article on "Weather and Crops in Europe in 1904," *Journal*, Vol. XI., p. 479, Nov., 1904.

† *Journal*, Vol. V., p. 300, Dec., 1898; Vol. VI., p. 293, Dec., 1899; Vol. VII., p. 311, Dec., 1900, Vol. XI., p. 414, Oct., 1904; Vol. XI., p. 608, Jan., 1905.

applied nor had any artificial feeding been given to the stock grazing on it, except to an insignificant extent. The soil is a stony loam resting on a bed of boulder clay, which covers the rocks to a considerable depth. Of its class it forms a fairly good pasture, which has been stocked for more than half a century with a flock of Cheviot ewes, kept for rearing half-bred lambs, along with a sprinkling of young cattle.

Plan of the Experiment.—The experiment was carried on through the summer season only for a period of twenty weeks each year, except in 1901, when, owing to the late spring, the grazing period was sixteen weeks only.

As in similar experiments, the number of sheep put on each plot was varied according to the condition of the herbage. The manures applied per acre were as follows :—

Plot No. 1.—$7\frac{1}{2}$ cwt. basic slag, containing phosphoric acid equal to that applied on Plot 2 in the form of superphosphate ; in April, 1899.
$5\frac{1}{2}$ cwt. basic slag, containing phosphoric acid equal to that applied on Plot 2 in the form of superphosphate ; in January, 1901.

Plot No. 2.—$7\frac{1}{2}$ cwt. superphosphate (31·2 per cent. soluble), in April, 1899.
5 cwt. do. (30·7 do. do.), in January, 1901.

Plot No. 3.—The same manures as on Plot 2, with the addition of $1\frac{1}{2}$ cwt. muriate of potash (47 per cent. potash), in April, 1899, and 1 cwt. muriate of potash (47 per cent. potash), in January, 1901.

Plot No. 4.—The same manures as on Plot 3, with the addition of $1\frac{1}{2}$ cwt. nitrate of soda, in April, 1899, and 1 cwt nitrate of soda, in January, 1901.

Plot No. 5.—No manure.

Effect of Manures on the Herbage.—Early in the experiment it became apparent that while the manured plots gave a much greater increase in live weight during the first two months of the grazing season, the unmanured plot did quite as well during the remainder of the season. In the first eight weeks of 1900 the total gain in live weight made on the unmanured plot was 169 lb., while on the superphosphate plot it was 269 lb., and on the basic slag plot it was 270 lb. In the remaining three months the total gain made on the unmanured plot was 187 lb., while on the superphosphate plot it was 167 lb. only, and on the basic slag plot it was 187 lb., or exactly the same as on the unmanured plot. A careful examination of the plots, however, provided an explanation of the failure of the manured plots. It was found that the manured plots were full of the stems of grasses carrying ripened seeds, while on the unmanured plot

such ripened stalks were conspicuously wanting. It became apparent, therefore, that one notable result of applying phosphates to this poor pasture was to give the grasses growing on it the power of ripening their seeds. On the unmanured plot the plants appeared to be unable to produce seed, and they continued throughout the whole season making abortive attempts to do so, and in their efforts produced continuous supplies of fresh green forage for stock. But on the manured plots, with the help of the phosphates, the plants succeeded early in the season in producing an abundance of ripened stems and seed. The stems, being less palatable to the sheep than the leafy foliage, were left untouched till the ripening was completed, and as the season went on they became so much harder and less palatable that the stock would not eat them at all. But this ripening of the seed had also a very damaging effect on the production of further eatable forage. The plants, having succeeded in their great natural function of producing seed, rested exhausted, and ceased to send forth such an abundance as before of new shoots and leaves. Consequently, after the seeding period, the manured plots became actually less valuable for grazing purposes than the unmanured.

In the records of other similar experiments no reference has been made to this effect produced by the manures, but that it must have occurred on all of them to a greater or less degree seems probable—at any rate, on all those pastures on which the phosphatic manures exercised a marked effect. The influence that phosphates have in promoting the formation of seed, and thus quickening and hastening the harvest, is constantly seen in the cereal as well as in other crops, and the absence of phosphate shows itself in later maturity and in a less production of seed. In the case of pastures like that at Downan, from which the phosphates have been regularly removed for a long series of years in the bodies of the live stock grazing on them, the deficiency in phosphates appears to have reached the stage at which the formation of seeds by the grasses occupying the pasture is rendered impossible, and, while that indicates both a low yield and a poor nutritive quality in the pasture, some compensation is provided in the constant and unceasing growth of the grasses throughout the whole season, and in the prevention of

that temporary cessation of growth and impoverishment of the stems, leaves, and roots which necessarily occur in the process of seed formation.

The effect, therefore, of the application of the manures was not merely an increase in the productiveness of the pasture, but also an alteration in its character from that of a herbage-producing to that of a seed-producing pasture. The former effect was beneficial, but if the improvement effected on the pasture in the early part of the summer were to be followed regularly by a deterioration in the later part, it was obvious that the benefit resulting from the manuring would be greatly diminished, or altogether lost.

Importance of Heavy Stocking.—If the full beneficial effects which the manures seemed capable of producing were to be got, it was essential that the seeding of the grasses should be prevented, and it was plain that this could be done, as is done in all skilful management of over-luxuriant pastures, by stocking them heavily in the early part of the season, and eating the grasses well down just when they were approaching the seeding stage. With this object cattle were grazed on the plots for as long as seemed necessary, with very satisfactory results. This not only gave a direct return in the cattle, but, through its effect in preventing the seeding of the grasses, it kept the pasture on the manured plots fresh and vigorous throughout the season, and enabled the manured plots to produce larger increases of mutton in the later as well as in the earlier part of the season. Had the method of combining a cattle with a sheep stock been adopted two years earlier, there can be little doubt that the total returns given by the manured plots throughout the experiment would have stood at higher figures than they now do, and that, had the full influence that the manuring had on the pastures and the proper method of managing them been earlier understood, the total gain produced would have been more exactly reflected in the figures.

But the fact that the manures produce an effect on the pastures which necessitates some change in their management is one that is deserving of attention. That an improvement can be effected, and that in consequence thereof more stock can be kept and greater gains in weight be made, are the exact results

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that would be anticipated by any farmer who applied manures to his pastures. But probably the important fact would be generally overlooked that, in order to obtain such benefits as the manuring would be capable of producing, some changes might require to be made in the management of the pastures adapted to the change brought about in their character and productiveness.

Variation in Gain in Early and Late Summer.—An examination of the variations in the monthly gains of weight brings out the remarkable and suggestive fact that increases made by the sheep were much greater in the first eight weeks of the summer than in the subsequent twelve weeks. Thus on the basic slag plot the gain in the first two months on the average of four years was 275 lb. compared with 170 lb. in the last three months, on the superphosphate plot 276 lb. compared with 148 lb., and on the unmanured plot 223 lb. compared with 127 lb. Moreover, on the unmanured plot the monthly gains were:—First month, 142 lb.; second month, 81 lb.; third month, 39 lb.; fourth month, 58 lb.; and fifth month, 30 lb.

The fact that sheep put on to summer pastures make such a very large proportion of their increase in the first four weeks is one of very great interest and suggestiveness to all practical graziers, to whatever cause it may be attributed. It can hardly be attributed wholly to a marked superiority of the pastures in the early part of the season, though, doubtless, the grasses deteriorate in feeding value as the season progresses, and this probably accounts wholly for the small accretion of weight made by the sheep in the third month, which falls about the seeding time of the plants on such pastures. The improvement found in the fourth month was due, probably, to the fact that the grasses had then got past the seeding stage, and were once more making a fresh and vigorous growth. But the great superiority of the gains in the first month can hardly be wholly credited to a superiority in the nutritive quality of the grasses, which in the second month should not have been much less nutritious. The chief causes were doubtless physiological, and were to be found in the animals themselves, and not in the pastures on which they fed. But the fact remains one of the most interesting that has been revealed in these experiments, and Professor Wright observes

that it is fraught with importance, significance, and suggestiveness as to the most profitable manner of managing stock on grazing farms.

Increased Stock Carrying Capacity of Manured Plots.—Apart from any question of the period at which the manures produced their greatest effect on the pastures, and of any change made in their character, the experiments clearly showed that the manures enabled the pasture every year on every one of the manured plots to carry an increased head of sheep stock, varying from 11 to 33 per cent.

General Result of the Experiment.—Professor Wright, in the publication from which the above particulars* are taken, discusses various other points of interest which were brought out by the experiment. The general results are summarised in the following table :—

No. of Plot.	Manures Applied.	Cost of Manures.	Live-weight Increase of Sheep per Acre in—							Live-weight Increase per Acre in 6 Years in excess of Plot V.		Value of Cattle grazing in excess of Plot V., at 1/- per Head per Week.	Net Gain +, or Loss −, per Acre, Cattle grazing and Cost of Manure being included.
			1899	1900	1901	1902	1903	1904	Tl.	Weight in lb.	Value at 3d. per lb.		
			lb.	lb.	lb.	lb.	lb.	lb.	lb.				
I.	Basic slag	25/1	140	156	108	159	134	146	843	181	45/3	6/4	+ 26/6
II.	Superphosphate ...	37/6	136	145	118	147	135	138	819	157	39/3	6/4	+ 8/1
III.	Superphosphate and potash ...	58/3	132	148	118	144	110	140	792	130	32/6	6/4	− 19/5
IV.	Superphosphate, potash, and nitrate of soda ..	81/-	134	160	114	140	114	143	805	143	35/9	11/8	− 33/7
V.	No manure	—	110	119	84	110	124	115	662	—	—	—	—

All the manures improved the feeding quality of the pastures, just as certainly as they increased their total yield, and this improvement continued for the four years after the application of the manures during which the experiment continued. But

* Bulletin No. 35 of the West of Scotland Agricultural College.

there seems to be an indication in the reduced differences in the returns of 1904 that the influence of the manures on the quality was becoming somewhat less in the fourth season, as it was also on the quantity of pasture produced.

The best returns were got from the basic slag, but the superphosphate, though more costly, also proved an effective manure. It must be remembered, however, that the figures of gain and loss are only of value for comparative purposes, and cannot be taken as representing the profit or otherwise which would be obtained from the use of manures under ordinary farming conditions. Under such circumstances the conditions would probably be more favourable to the use of manures.

Suggestions as to Dipping of Sheep.

Suggestions as to the dipping of sheep have been issued in Leaflet 61 as regards the prevention of Sheep Scab, and in Leaflet No. 145 in regard to the prevention and destruction of other parasites, such as keds and lice. In the course of the dipping which was carried out last year in Scotland, of which an account has already been given in this *Journal*, December, 1905, p. 516, several points came under the notice of the Board's Inspectors in regard to which some suggestions may be made supplementary to the information given in the above-mentioned Leaflets.

Cleansing of Dipping Tanks and Baths.—The importance of cleansing the bath and of renewing the material from time to time is not always sufficiently recognised. Where large numbers of sheep are put through the bath without any steps being taken in this direction, the solution must of necessity become very dirty and mixed with urine, dung, soil, shed wool, &c., together with the ova of the various parasites which are washed out of the fleece.

A good deal in the way of cleansing might be done by passing a wooden rake over the surface of the solution and along the bottom of the bath, thus removing the larger particles of wool, rubbish, &c.

Cleaning of the Catching Pen.—After each lot of sheep have been through these pens, the pens should be thoroughly swept

out with a hard broom. This would prevent manure and dirt being carried into the bath by the sheep or draining back with the surplus dip after dipping. The catching pen should be made with a slight slope away from the dipping tank.

Mixing of Dips.—It is not an uncommon practice to use a mixture of two or more dips, usually a non-poisonous and a poisonous one. The practice is not one to be recommended, but if it is done it is necessary that at least one of the ingredients should be of full strength. For example, it would not be satisfactory to use half strength of an arsenic dip mixed with half strength of a carbolic dip. One or other should be of full strength. It is, however, desirable that the dips should be made in the proportions recommended by the Board, or if manufactured dips are used that the solutions should be made up according to the instructions issued by the seller.

Time of Immersion.—The period of immersion should not be less than half a minute. There is frequently a tendency to hurry the sheep through the bath, especially when they are known not to be affected with scab. It must be remembered, however, that, apart from this disease, dipping is very valuable on account of its destructive effect on other parasites, and this is materially increased by longer immersion. The number of insects and their eggs liberated and washed out of the fleece by dipping for a sufficient time is remarkable.

The head and neck of the sheep should receive special care, on account of the number of ticks and keds usually found on those parts. A little extra time in the bath will facilitate the dip penetrating to the skin, and also assist in the removal and destruction of parasites and their ova.

Trimming the Wool.—Before and at the time of shearing it is customary to remove the dirty wool from the hind parts of the sheep. This should be removed from the farm as soon as possible, or should be at once buried or burned. Piles of these portions of wool, frequently containing maggots, may sometimes be seen round the catching pens. The destruction of this material, either by burning or burying, appears essential to the protection of the flock, particularly in the event of scab being present.

Period of Dipping.—The value of dipping is fully recognised by first-class sheep farmers. Some dip the in-lamb ewes from

one month or three weeks before lambing with very good results, great care being naturally exercised in handling the ewes. Under these circumstances the sheep must not be turned on to its back, so that the swimming bath is alone suitable for use at this time. Many farmers consider it better to dip at an advanced stage of gestation than earlier. It was observed that where spring dipping of the in-lamb ewes had taken place the lambs were comparatively free from keds; the destruction of a large proportion, if not all, of the keds on the ewes being the means of keeping down their number on the lambs. Dipping at this time, moreover, by preventing the irritation due to keds, keeps the ewes quieter, and the lambing season is, in consequence, likely to be attended with better results. The lambs grow better, become fatter, and have better fleeces: all points which improve the sale and increase their market value.

Summer dipping is carried out more or less frequently, according to the conditions of weather and the presence of the fly. In some instances it is found advantageous to dip as often as once a month, or even oftener if the fly is very troublesome. The fly is particularly destructive at low and moderate elevations, especially where plantations, brushwood, or brackens are abundant. Here the sheep may remain hidden and die before they can be found for treatment. For this reason, many sheep owners who have large areas of land to watch over find it cheaper and more practical frequently to collect and dip the sheep as a preventive means. It is stated that when the fly is prevalent the results fully justify this practice.

On the high hill sheep farms of Scotland, where the fly is either not present, or, at any rate, not sufficiently numerous to be very destructive to the sheep, the flock is not usually dipped till about the middle or end of August, when the lambs are weaned and the general departure of lambs to the various sales takes place. The chief objection advanced by hill farmers to an earlier dipping is that when lambs and ewes are dipped and turned away together they are apt to lose one another, and, consequently, through unrest and want of milk, the lambs lose condition. The natural instinct to find one another seems to be affected by the presence of the dip in the

fleece, and, consequently, it may happen that many lambs may fail to find their dams.

Besides the dipping in August it is the custom to pass the flock through the bath again in October or November, at the time when the cast ewes are removed, and before the rams are turned out.

Infestation of Nurseries in France by the Plum Weevil.

Instances of the abnormal development of the attacks of insect and fungoid pests are not uncommon, the contributing causes being commonly the increased cultivation of a particular crop and an insufficient attention to the importance of rotations. An example of this was mentioned at a meeting of the French National Society of Agriculture by M. Paul Vincey, who stated that the district of Vitry-sur-Seine has been greatly infested of late by an insect which had previously not been at all prevalent in the basin of the Seine. This was the Plum, or Red-legged, Weevil* (*Otiorrhynchus tenebricosus*), which has proved most destructive to fruit and also to lilac trees. Among the preventive and remedial measures which were adopted against its attacks in the various stages of its life-history were mentioned spraying with arsenical solutions, use of mechanical obstacles, such as sticky bands round the trees to stop the ascent of the insects, the deposit of little heaps of quick-lime at the foot of the stems, and the construction of trenches, with or without traps at the bottom, to stop the movement of the insects from one orchard to another. The only one of these which gave any appreciable result was the spraying with arsenical washes. The injection of bisulphide of carbon into the soil was also tried. The collection of the insects by hand was, however, the remedy most largely adopted. The municipality and the local society of horticulture made grants of money in aid of their extermination, and for about a month from the middle of April numerous persons, especially women, were employed to collect them, at first at the rate of 8 fcs. per kilogramme (about 2s. 10½d. per lb.), and afterwards, as they acquired skill, at 5 fcs.

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* See Leaflet No. 2.

In a circular letter addressed by the Board of Agriculture to Local Authorities, and dated 12th January, 1904, it was pointed out that in order to mitigate the inconvenience to which pig-owners must necessarily be subjected by the operation of restrictions of a general character, it was very desirable that the provisions in Local Regulations should so far as practicable be uniform in form and substance, especially in the case of the Regulations of a county and of the boroughs situated geographically therein. In framing the Swine Fever (Regulation of Movement) Order of 1903 the Board had this point specially in view, and they had further in contemplation the possibility of applying the provisions of that Order to groups of Local Authorities, thereby rendering possible the free movement of swine in larger areas than those of a single county, whilst affording to each Local Authority concerned the security that the precautionary measures which their own Regulations are designed to achieve should be enforced throughout the larger area.

Movement of Swine in Combined Districts.

In a subsequent circular letter, dated 27th January, 1906, the Board observe that, in their opinion, the time has now arrived when it is desirable that the policy of grouping together the districts of Local Authorities for the purposes of restrictions relating to the movement of swine, suggested in their previous communication, should be further developed.

Statistics are given which show that the decrease in the number of outbreaks of swine fever in Great Britain since the year 1901 has been continuous, and, broadly speaking, that the improvement has been manifested in all parts of the country. It is also noticeable that in counties where the disease still unfortunately continues, comparatively speaking, to be prevalent, the outbreaks which occur are in a considerable measure confined to much more restricted areas, rendering it less difficult than formerly to control the spread of disease in a locality by means of restrictions on movement specially applied thereto.

The marked improvement which has been brought about in the swine fever position in Ireland, where the outbreaks fell to 48 in 1905, as compared with 181 in 1904, is also a factor to be taken into consideration in this connection.

The Board believe that it can with justice be maintained as regards Great Britain that the present hopeful position has largely been brought about by the continued enforcement of the general restrictions upon the movement of swine imposed by the operation of the Swine Fever (Regulation of Movement) Order of 1903, or alternatively by restrictions of a similar character embodied in Regulations made by Local Authorities. The areas to which the Board's Order at present applies are thirteen in number.

The effect of the application of the Order of 1903 and the suspension of Local Regulations is to permit of the free movement of swine throughout the entire area, whilst prescribing in the case of the movement of swine into any part of the area the adoption of certain precautionary measures designed to prevent the spread of swine fever; and it appears to the Board to be of fundamental importance that restrictions of such a character though not necessarily applied to areas so limited as those of single counties, should be maintained throughout the country for some considerable period. They propose to extend considerably the application of the Swine Fever (Regulation of Movement) Order of 1903 to groups of counties in the near future.

In determining how far the grouping of counties can at a given moment be carried into effect, the Board must be guided by the swine fever position and the history of swine fever in the various districts. The character and extent of the pig industry, as well as the general trend of the pig trade, must also be taken into consideration, it being clear that for the purpose in view barriers should be maintained at which the movement of swine from the principal counties from which pigs are widely distributed throughout the country can be controlled until such time as the danger of an epidemic of the disease in pig-exporting counties has passed away. Otherwise the whole of the improvement hitherto effected by the operations against the disease may be lost.

With every desire on the part of the Board to meet, so far as possible, the wishes of Local Authorities as regards the grouping of counties, it is almost inevitable that some disappointment will be felt locally at the decisions of the Board. Each county is naturally inclined to wish to find itself grouped with most of, or

all, its immediate neighbours, and where markets are concerned there is a legitimate desire to see any restrictions removed which affect the area from which supplies of swine are normally drawn. Neither of these objects could, however, be fully complied with throughout the country without destroying the foundations upon which the scheme is based. It is inevitable, therefore, that as regards certain localities the inconvenience which restrictions upon the movement of swine entail cannot at present be removed.

It is apparent that the carrying out of a project of this character must in the long run devolve upon the Central Authority, and that its development will be seriously impeded unless the principles laid down above are adhered to. It is, therefore, highly desirable that individual Local Authorities should refrain from pressing upon the Board proposals which are not in accordance with their publicly announced policy, and also from adopting, in agreement with adjoining Local Authorities, any modification of Local Regulations until they have ascertained that such action would not conflict with the schemes of the Central Authority. It is also important that Local Authorities should clearly understand that it will not be possible for the Board to acquiesce in the revocation of existing Local Regulations until the time is ripe for the formation of a group of counties.

On the other hand, where it is so desired, the Board will be prepared, on the application of the Local Authority, to substitute the provisions of the Swine Fever (Regulation of Movement) Order of 1903 for any existing Local Regulations (with or without restrictions regulating the movement of swine within the district as may seem desirable), thus assuming direct responsibility for the continuance of restrictions.

It has been found necessary, when applying the Swine Fever (Regulation of Movement) Order of 1903 to the districts of more than one Local Authority, to suspend the operation of all Regulations which may have been made by Local Authorities, under the Swine Fever Order of 1894, inasmuch as inconvenience might arise if any one Local Authority within the combined district were to put in force Regulations relating to the movement, exposure or sale of swine within their own area.

Uniformity within the combined district is thus so far as possible ensured. The Board, however, are willing at any time to consider representations made to them by any of the Local Authorities concerned, in favour of the imposition, throughout a combined district, of special restrictions of the character just indicated, and they will also at once impose general restrictions on the movement of swine over areas forming part of a combined district where such a course appears necessary for the prevention of the spread of the disease.

It is evident that the combined action proposed to be taken must depend for its success upon the vigilance of each Local Authority in securing the strict enforcement of the Board's Order, since failure to do so on the part of any one Local Authority may expose the districts of the other Local Authorities in the group to an increased risk of the introduction and spread of the disease. The Board desire, therefore, to impress upon all Local Authorities, whether those of counties or of boroughs, the importance of maintaining adequate arrangements for the administration of the Board's Orders within their respective districts. The Inspectors of the Board are instructed to supervise closely the local administration in this respect, and are at all times available to advise and assist Local Authorities in this important matter.

It is hoped that the gradual development of the policy herein set out will operate in the direction of the simplification of the administrative procedure, by securing an amount of uniformity in the character of the necessary restrictions far in excess of that which has hitherto existed. Such a result will be advantageous, not only to the officers of Local Authorities and to those engaged in the trade in swine, but also to the officials of Railway Companies who have in the past done so much to assist the executive officers of the Board and of Local Authorities in enforcing the requirements of the various Regulations affecting the movement of swine.

Live Stock Import Regulations—Western Australia.*

According to regulations under the Stock Diseases Act, 1895, and dated 24th September, 1902, no stock shall be landed at any port of Western Australia other than Fremantle, Albany, Champion Bay, Cossack, Eucla, Esperance, and Bunbury, unless they shall have been first inspected and passed by an inspector of stock at any one of these ports. All stock found on arrival by an inspector to be suffering from any infectious or contagious disease shall be forthwith destroyed, or kept and treated in quarantine, as such inspector shall direct.

Quarantine.—All stock imported into Western Australia from Great Britain shall undergo quarantine as follows:—Horses, fourteen days; cattle, thirty days; sheep, fourteen days; and pigs, thirty days. All expenses of landing, removing to, maintaining and keeping in quarantine, and of disinfecting or otherwise treating any stock shall be paid by the owner or consignee of such stock to the inspector upon demand, and before such stock shall be removed from quarantine. Fees for the examination of the stock shall be as follows:—Horses and cattle, one to five head, 10s., and 1s. for every additional head; sheep and pigs, one to fifty head, 10s., and for every additional head, 1d.; provided that the whole amount of fees for inspection of any one shipment by the same owner shall not exceed £5.

Horses and Cattle.—By regulations dated 30th March, 1904, horses and cattle imported into the Colony from Great Britain shall, immediately before leaving the place of shipment, be subjected by a duly qualified veterinary surgeon in the case of horses to the mallein test for glanders, and in the case of cattle to the tuberculin test for tuberculosis. A certificate of the veterinary surgeon that they have been submitted to such test and are free from disease or infection must be produced before the landing of the stock will be permitted. All such stock may be again subjected to the mallein test or to the tuberculin test, as the case may be, after their arrival and before they are released

* Live stock import regulations have been published in this *Journal* for the following countries:—United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, August, 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria Nov., 1905; Spain, Dec., 1905; and Queensland, Jan., 1906.

from quarantine if, in the opinion of the Chief Inspector of Stock, such test is necessary.

By regulations dated 19th July, 1905, the vessel carrying stock for importation into Western Australia shall not, for a period of six weeks preceding the embarkation of such stock, have carried any stock otherwise than from the United Kingdom.

The following correspondence on the subject of the rating of orchards has taken place between this Department and the Local Government Board:—

Rating of Orchards.

Board of Agriculture and Fisheries,
4, Whitehall Place, London, S.W.,
4th December, 1903.

SIR,—I am directed by the Board of Agriculture and Fisheries to call the attention of the Local Government Board to the following recommendation of the committee appointed by Lord Onslow to inquire into the position of fruit culture in Great Britain, viz., "that in the assessing of agricultural holdings for local rates the assessment should not be raised by reason of the planting of fruit for a period of five years after the planting in the case of small fruit, of seven years in the case of mixed plantations, and twelve years in the case of orchards" (Report, Cd. 2589—Recommendation (15), p. 38).

The Board would be glad to be favoured with the observations of the Local Government Board thereon.

I am, Sir, your obedient servant,
A. W. ANSTRUTHER,
Assistant Secretary.

The Secretary,
Local Government Board,
Whitehall, S.W.

Local Government Board,
Whitehall, S.W.,
29th December, 1905.

SIR,—I am directed by the Local Government Board to advert to Mr. Anstruther's letter of the 4th instant with reference to a recommendation made by the Departmental Committee upon

Fruit Culture in Great Britain relative to the assessment of orchards and fruit plantations to local rates.

In reply I am directed to state that the Board are not sure that any amendment of the law is required to meet the point referred to by the committee. If, in fact, any injustice is created by the over-assessment of the occupier of an orchard, the fault would generally result from the action of the overseers or the Assessment Committee, and any such action is, under the existing law, subject to correction by means of an objection to the Valuation List or an appeal against the Poor Rate.

The Board may at the same time point out that orchards, in the matter of the General District Rate and the separate rate for special expenses, have, at the present time, under the Public Health (Rating of Orchards) Act, 1891, the advantage of a partial exemption ; and that orchards are also included in the definition of "agricultural land" for the purposes of the Agricultural Rates Act, 1896, as continued in force by the Agri cultural Rates Act, 1896, &c., Continuance Act, 1905.

I am directed to add that the Royal Commission on Local Taxation recommended that no further extension of the principle of exemption from liability to rates should be permitted (see page 50 of their Final Report—1901 Cd. 638). In so far, therefore, as the proposal might involve any further partial exemption, it would appear to be at variance with this recommendation.

I am, Sir, your obedient servant,

H. C. MONRO,

Assistant Secretary.

The Secretary,

Board of Agriculture and Fisheries.

The effect of the Public Health (Rating of Orchards) Act, 1890, referred to above, is that the occupier of any land used as orchards shall be assessed to the General District Rate in an urban district or to a separate rate levied in respect of special expenses within the meaning of the Public Health Act, 1875, in a rural district in the proportion of one-fourth part of the net annual or ratable value of such land.

Natural Enemies of Insect Pests.

The Mediterranean Fruit Fly (*Ceratitis capitata*) has for many years been a serious pest in various places, notably in Australia, South Africa, and Bermuda. Recently it has been suggested that the original home of this destructive pest is Brazil, where it is kept in check by the existence of natural enemies, especially a species of Ichneumon fly and a species of Staphylinid beetle. The fact that the fruit fly is known as a pest in Bermuda, where natural enemies do not occur, while in Jamaica it is not a serious pest, has suggested that enemies allied to the Brazilian species exist there, and the Government of Bermuda is making efforts to introduce and establish the natural enemies of the fruit fly found in Jamaica. A proposal was also made to introduce the small green fly-catching lizard of Jamaica as well as certain birds with a view to combat the ravages of the fly. In connection with this latter suggestion, Dr. Sharp, of Cambridge, communicated in 1904 to the Board some observations which are of general interest, apart from the special case to which they more particularly refer.

The chief enemies of insects are other insects and minute fungi. Insects in the natural conditions of their existence are kept in check by a host of parasitic insects, of which various kinds are specialised for attacking their food-insect in particular stages. It appears probable that under natural conditions 80 or 90 per cent. of the annual increase of insects is destroyed by other insects.

On the other hand, vertebrates take but a small proportion. and are not specialised to attack any particular species of insect, The greatest destruction they effect is probably exercised on the larvæ. The fly that is destructive to fruit in Bermuda is not specially suited for attack by vertebrates—the larva is concealed, and the flies themselves affect situations on trees and flowers where they would only occasionally be caught by lizards or birds. It may therefore be taken as certain that the introduction of these animals into Bermuda would not diminish the number of flies to any extent. At present it appears that the number of flies is only limited by the supply of their food. As they have enormous powers of multiplication, the destruction of

a small number of specimens would almost at once be made up for by this fact.

As regards the general question whether the introduction is desirable for other reasons, it should be remembered that the natural animal and vegetable inhabitants of a particular region form an assemblage in which there is a natural though very complex balance, and it is interference with this that usually causes economic difficulties. Attempts to remedy this trouble by random introductions always fail, and it may be stated as a rule that introductions of the kind proposed are generally regretted subsequently, and frequently cannot be remedied.

If it be decided to try and check this fly in Bermuda, it will be necessary to discover its natural history thoroughly, and then to find out in what parts of the world it lives without being injurious, to discover what there keeps it in check, and introduce this into Bermuda.

These observations were communicated to the authorities in Bermuda, and, as stated above, it is in this direction that the Government of Bermuda are now seeking a remedy for this pest. Some instances in which this method appears to have been attended with success in the United States were mentioned in last month's *Journal* (p. 623).

It may be mentioned that that this fly (*Ceratitis capitata*) occurs in Great Britain, but it is not thought that there is any probability of its becoming injurious to fruit grown out of doors here, though it might do so any time if it were to get into glass-houses where fruit is grown. At present it is very rare in this country.

A Tree-Strangling Fungus.

This fungus (*Thelephora lacinata*) has long been known as a destructive pest to young trees of various kinds. Quite recently some hundreds of ash saplings were killed by it. The fungus is not a parasite ; that is, it does not penetrate the tissues of the plant it attacks, but causes death by strangulation. The fungus is most abundant on sandy heaths, where it forms large patches of a dark brown colour on the ground ; these patches consist of several overlapping thin plates

with irregularly toothed margins. When it happens to be growing near to a plant of heather or ling, it grows up round the stem, to which it adheres very closely, giving off from time to time a loose frill as it ascends. It extends up the stem for a

ASH SAPLING STRANGLED BY THELEPHORA.

distance of six inches to a fcot or more, and in course of time kills the stem it has encircled.

Young conifers planted in such situations often suffer severely, it being no uncommon sight to see almost every tree encircled by the fungus, and small examples are often entirely enveloped in its folds.

In nurseries where the ground is carefully cultivated the fungus does not gain a foothold, and when trees are planted in localities where the fungus abounds, if the soil round the stem is broken up once a year all danger will be avoided.

Forestry Diploma at Oxford.*

The University of Oxford, by a statute passed in 1905, has provided for the appointment of delegates for superintending the instruction of probationers for the Indian Forest Service and the granting of diplomas in forestry to members of the University generally. The diploma in forestry will be granted to members of the University who have (1) pursued an approved course of study extending over two years in Oxford; (2) undergone a course of practical work at places and under conditions approved by the delegates; and (3) satisfied the examiners in prescribed examinations.

The practical course in forestry comprises nine months, from the early part of October to the beginning of the following July. For about seven months the students are placed with selected German forest officers, who will introduce them to the management of well-regulated forest districts which have been under systematic management for a long period of time. During the remaining time students will visit and examine specially interesting forest districts, so as to become acquainted with the management of forests under varying conditions. The students will keep diaries in German, in which they record their observations, with critical remarks. They will also prepare a complete working plan for a small range.

There will be two examinations (partly written and partly practical) for the diploma. The subjects of the first examination will be botany, geology, and entomology; and the subjects of the second examination will be forestry, theoretical and practical, including silviculture and the protection, utilisation, management and administration of forests. The conditions of admission to the examinations require candidates to have passed responsions or an equivalent examination,

* For previous notes as to Forestry Education, see *Journal*, Vol. XI., p. 1, April, 1904; Vol. XI., p. 751, March, 1905; and Vol. XII., p. 564, Dec., 1905.

to have satisfied the examiners in the preliminary honour examinations in natural science, in the subjects mechanics and physics, chemistry and botany, to have attended approved courses of instruction in certain subjects, to have passed examinations in organic chemistry and surveying, and to satisfy the delegates as regards a knowledge of mathematics.

Telephones in Rural Districts.

The Board of Agriculture and Fisheries have been in communication with the Postmaster-General with reference to the recommendation made by the recent Departmental Committee on the Fruit Industry as to the desirability of the further extension of the telephone system in country districts, and they are informed that for some years past the Post Office has been steadily extending the trunk wire system to small provincial towns, and building up local exchange systems in rural districts which had previously been left untouched. There has been increased activity in this branch of Post Office expansion since, in March, 1904, Parliament granted additional funds for the development of the telephone system, and it is now in operation in a considerable number of towns.

Among other extensions benefiting fruit-growers, an exchange system has been established in the district of Swanley, Farningham, Hextable, and Crockenhill ; also at Westerham, Kent, and at Winchcombe in Gloucestershire. In some cases the distance of towns or villages from any existing trunk wire centre renders the cost of extensions prohibitive, but as the system of main wires extends these difficulties will diminish.

The Postmaster-General informs the Board that he will be glad to receive any specific suggestions as to further improvement which may be submitted on behalf of fruit-growers, and also as to the localities where the need of the telephone for the purposes of this industry is most pressing.

The Board have communicated the above information to the principal Fruit and Horticultural Associations and Societies, and in inviting their suggestions and observations stated that they would be glad to be favoured with any information which they could supply as to particular places where the introduction

of a telephonic service would be attended with special advantage to fruit-growers.

Agricultural Co-operative Federation.

The Board are informed that the business which has hitherto been transacted by the Advisory Business Department of the Agricultural Organisation Society for the supply of the agricultural requirements of the affiliated societies in England and Wales has now been taken over by the Agricultural Co-operative Federation, which has been registered under the Industrial and Provident Societies Act. All correspondence with manufacturers, merchants and others for the purchase of agricultural requirements will henceforth be done in the name of the Agricultural Co-operative Federation, and not by the Advisory Business Department of the Agricultural Organisation Society, as heretofore.

It is proposed that this central body shall act as a commission agent on behalf of any particular society. The preliminary capital will be raised by requiring every society which takes advantage of the facilities offered by this central body to take shares in proportion to its annual turnover; thus one share of £1 for every £500 worth of purchases made up to ten shares, one share for every £1,000 worth of purchases from ten to twenty shares, &c. The maximum number of shares held by any one society is not to exceed 100. All profits, after all expenses have been paid, are to be distributed as bonuses proportionally to the purchases.

Miscellaneous Notes.

Cultivation of Macaroni Wheat in the United States.—With reference to previous notes* which have appeared in this *Journal* on the subject of "durum," or macaroni wheat, it is stated in the annual report of the United States Secretary of Agriculture that in 1905 the probable production of this grade of wheat was 20,000,000 bushels. During October it is reported that about 6,000,000 bushels were shipped to Europe to Mediterranean ports. It will be seen from this that the cultivation of

* *Journal*, July, 1904, p. 208, and Dec., 1904, p. 543.

this crop has made considerable progress in the United States. It was first introduced from East and South Russia in the spring of 1879, and the production has steadily increased up to the present time. It is chiefly grown in the three States of North Dakota, South Dakota, and Minnesota, and also in Kansas, Nebraska, Colorado, and the Rocky Mountain and Pacific Coast States.

Among the advantages claimed for the crop are the following:—It is well adapted to dry regions and to considerable areas where other kinds of wheat will not succeed. Even in those portions of the semi-arid districts where other wheat can be grown, the yield per acre of durum wheat exceeds that of the former by 30 to 100 per cent. Its average rust resistance is very much greater than that of the common sorts. It is therefore adapted to many parts of the United States where the conditions would be adverse to other grains.

Destruction of Ants' Nests.—A successful method of destroying ants' nests is to treat them with bisulphide of carbon in the following way:—Make a hole 8 to 12 inches deep in the nest, or two holes if the nest be very large, by means of a stick or iron bar. Pour into these holes 2 oz. of bisulphide of carbon, and immediately cover the holes with earth. The bisulphide of carbon will vaporise, and its fumes will kill the ants. The work should be carried out at night, or towards the close of the day, but under no circumstances must a naked light be brought near the bisulphide of carbon or an explosion will occur. Care must also be taken by the operator not to breathe the fumes, and if these two points be borne in mind the use of the material is both safe and effective. If an ant nest should be found alongside a valuable plant, the bisulphide of carbon must be applied so that the liquid does not touch the roots of the plant.

Consumption of Fertilisers in Japan.—The French Vice-Consul at Kobe (M. Aymé Martin), has recently reported to his Government on the increasing demand for fertilisers in Japan, noticeable in recent years, owing to the adoption of scientific methods of agriculture. He states that in 1904 the imports of fertilisers, which had been growing steadily for some years, showed a slight diminution, owing to disorganisation caused by the war. During the first six months of 1905, however, the value

of the fertilisers (including oil-cakes) imported amounted to 12,976,352 yen, as compared with 5,757,075 yen in 1904. The increase was shown chiefly in oilcakes (7,265,109 yen, as compared with 2,035,279 yen); this remarkable increase was due to the resumption of commercial relations with Newchwang, the chief centre for the export of oilcakes. A large increase is also shown in the imports of sulphate of ammonia (638,217 yen), phosphate of chalk (1,179,304 yen), and nitrate of soda (636,997 yen) (1 yen = 2s. 0½d.). A very large proportion of this trade goes to Kobe, which takes six-sevenths of the oilcakes, two-thirds of the phosphate and sulphate, and one-half of the nitrates. China furnishes all the oilcakes imported; one-third of the nitrates are imported from the United States, and the remainder from Chile and various other countries; nearly the whole of the import of phosphate of chalk and sulphate of ammonia comes from the United Kingdom. There are a certain number of chemical factories at Osaka which produce fertilisers, more especially sulphate of ammonia.—(*Board of Trade Journal*, Jan. 11th, 1906.)

Tinned Milk in Burma.—The trade in preserved milk between Europe and Burma is enormous, and, says the *Rangoon Gazette*, there would seem every likelihood of its assuming still greater proportions. In every part of Upper Burma and the Shan States tinned milk is obtainable, and used by the people as a confection. Some makers go to the extent of printing labels and advertisements in Burmese. The *Gazette* adds:—"All makers seem to manufacture in Switzerland or Norway. It is strange that no one in Great Britain or Ireland seems to have thought it worth while to compete with Continental manufacturers. Hence, we buy in Rangoon 'Devonshire cream made in Norway.' One would think that the farmers in Devonshire and Cornwall might compete successfully in such an article with Norway or Switzerland. Apparently, they make no attempt to do so, and the whole trade, therefore, goes to the Continent."—(*Board of Trade Journal.*)

Duty on Wheat Flour in Italy.—The Italian *Gazetta Ufficiale* for the 19th December contains a Law, dated 10th December, reducing the import duty on wheat flour imported into Italy from 12·30 lire to 11·50 lire per quintal (from 5s. to 4s. 8d. per cwt.).

ADDITIONS TO LIBRARY DURING JANUARY.

Africa—

Gold Coast.—Report upon the Botanical and Agricultural Department for 1904. (25 pp.)

Australasia—

Statistics.—Six States of Australia and New Zealand. 1861-1904. (94 pp.)
New South Wales.—Statistical Register for 1904. Part IX. Agriculture. (477-610 pp.) 1905.
Tasmania.—Crown Lands Guide, 1905. (161 pp.)
New Zealand.—Department of Agriculture. Report, 1904–1905. (433 pp.)
The Crown Lands Laws of South Australia. (16 pp.) 1905.

Austria-Hungary—

Osterreichisches Statistisches Handbuch, 1904. (432 pp.) 1905.
Das Getreide im Weltverkehr. (375 pp.) 1905.
Bericht über das Osterreichische Veterinärwesen. (284 pp.) 1905.
Statistisches Jahrbuch des K.K. Ackerbauministeriums, 1904:—
Erstes Heft. Statistik der Ernte. 1904. (305 pp.)
Zweites Heft. Der Bergwerksbetrieb Osterreichs, 1904. 2 Lieferungen. (207 pp. + 365 pp.) 1905.

Belgium—

Ministre de l'Agriculture.—Recensement Agricole de 1904. (261 pp.)
Resumé des Statistiques Agricoles, 1900 à 1904. (57 pp.) 1905.
Notice sur l'Economie Rurale et l'Enseignement Agricole de la Belgique. (Exposition Universelle de Liége.) (190 pp.) 1905.

Denmark—

Statistisk Aarbog for Danmark, 1905. (195 pp.)

France—

Laveron, A. et Mesnil, F.—Trypanosomes et Trypanosomiases. (417 pp.) 1904.

Germany—

Bund Deutscher Nahrungsmittel-Fabrikanten und- Händler E. V.—Deutsche Nahrungsmittelbuch. (245 pp.) 1905.
Hutyra, Dr. F., und Marek, Dr. J.—Spezielle Pathologie und Therapie der Haustiere. 2 Bände. (873 + 971 pp.)
Ostermayer, A.—Leistungszucht und Leistungskontrolle. (101 pp.) 1905.

Great Britain—

Cox, J. C.—The Royal Forests of England. (372 pp.) 1906.
Theobald, F. V—Insect Life. Second Edition. (235 pp.) 1905.
University College, Reading.—Report of Experiments on the Rearing and Feeding of Turkeys. (7 pp.) 1906.
Aberdeen and North of Scotland College of Agriculture.—Bull. No. 3. Report on Sprouting Seed Potatoes. (9 pp.) 1906.
Roberts, I. P.—The Farmer's Business Handbook. (300 pp.) 1903.
Durham County Council.—Report on the Feeding of Dairy Cows and other experiments. (43 pp.) 1905.
Dorset County Council.—University College, Reading. Report on the Soils of Dorset, with Suggestions on Manuring, Cultivation, &c. (50 pp.) 1906.
Newsham, J. C.—The Horticultural Note Book. (418 pp.) 1906.
Henslow, Rev. Prof. G.—The Uses of British Plants. (184 pp.) 1905.
Reeks, H. Caulton.—Diseases of the Horse's Foot. (458 pp.) 1906.
Report of His Majesty's Commissioners for the International Exhibition, St. Louis, 1904. (457 pp.) 1906.
Lancaster County Council:—
Reports of Experiments with Potatoes at the County Council Farm, 1905. (23 pp.) 1905.
Reports on the Manuring of Meadow Land at the County Council Farm and various centres in the County. (19 pp.) 1905.

Great Britain—*Continued.*

Report of an Experiment on the Manuring of Mangels at the County Council Farm. (13 pp.) 1905.

Wright, Lewis.—The New Book of Poultry. (600 pp.) 1905.

West of Scotland Agricultural College.—Report of Experiment on Improvement of Poor Permanent Pasture, 1899–1904. (32 pp.) 1905.

Holland—

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No. 231. Spraying for Cucumber and Melon Diseases. (24 pp.) 1905.
No. 232. Okra: Its Culture and Uses. (16 pp.) 1905.
No. 233. Experiment Station Work, XXXI. (32 pp.) 1905.
No. 235. Cement, Mortar and Concrete: Preparation and Use for Farm Purposes. (32 pp.) 1905.
No. 237. Experiment Station Work, XXXII. (32 pp.) 1905.
No. 240. Inoculation of Legumes. (7 pp.) 1905.
No. 241. Butter Making on the Farm. (31 pp.) 1905.

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PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of January, 1906.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	7 9	—	36 5	33 4
Herefords	7 7	7 2	—	—
Shorthorns	7 5	6 10	35 8	32 9
Devons	7 10	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8	7¼	8½	6¾
Sheep :—				
Downs	9	8¼	—	—
Longwools	8¾	8	—	—
Cheviots	9¼	8½	9	8
Blackfaced	9	8¼	8½	7¾
Cross-breds	9	8¼	9	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 11	6 6	7 1	6 4
Porkers	7 6	7 1	7 8	6 9
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 8	17 12	22 1	16 19
,, —Calvers ...	20 10	17 8	17 19	16 7
Other breeds—In Milk ...	17 17	16 0	20 1	16 17
,, —Calvers ...	—	14 2	18 15	16 3
Calves for Rearing	2 2	1 13	2 8	1 14
Store Cattle :—				
Shorthorns—Yearlings ...	9 4	7 18	9 10	7 11
,, Two-year-olds	12 0	10 19	13 18	11 14
,, Three-year-olds	14 10	13 5	15 10	14 9
Polled Scots—Two-year-olds	—	—	15 10	13 1
Herefords— ,,	14 13	13 1	—	—
Devons— ,,	13 1	12 15	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	43 4	37 8	—	—
Scotch Cross-breds ...	—	—	34 11	30 8
Store Pigs :—				
Under 4 months	27 5	20 10	22 10	17 6

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1906.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	48 6	48 0	47 0	45 0	55 0*	52 6*
	2nd	46 6	43 6	43 0	40 0	52 6*	46 0*
Cow and Bull ...	1st	—	40 6	41 0	37 6	45 0	41 0
	2nd	—	36 0	35 6	33 0	37 6	34 0
U.S.A. and Canadian :—							
Birkenhead killed	1st	47 0	44 6	44 6	45 6	43 0	46 0
	2nd	42 0	40 6	41 0	41 0	—	42 0
Argentine Frozen—							
Hind Quarters ...	1st	28 6	29 0	29 0	28 6	31 0	29 0
Fore ,, ...	1st	25 6	24 6	24 6	24 0	25 0	25 0
Argentine Chilled—							
Hind Quarters ..	1st	30 0	32 0	31 6	31 0	—	34 0
Fore ,, ...	1st	25 0	25 6	25 0	25 0	—	26 6
American Chilled—							
Hind Quarters ...	1st	46 0	45 0	45 0	45 0	46 6	47 0
Fore ,, ...	1st	28 0	29 6	29 6	29 6	30 0	31 6
VEAL :—							
British	1st	73 6	62 0	70 0	74 0	—	—
	2nd	62 0	52 6	63 6	68 0	—	—
Foreign	1st	77 0	—	60 6	—	—	64 0
MUTTON :—							
Scotch	1st	71 0	67 6	74 0	75 0	71 0	64 0
	2nd	64 0	53 6	69 6	71 0	57 6	54 0
English	1st	67 6	69 6	70 0	69 0	—	—
	2nd	61 0	55 6	65 6	63 6	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	69 0	—	69 0	—	—
Argentine Frozen ...	1st	31 0	30 6	29 0	29 0	30 6	30 0
Australian ,, ...	1st	30 6	27 6	28 0	27 6	30 6	28 0
New Zealand ,, ...	1st	40 0	39 0	39 6	39 6	30 6	—
LAMB :—							
New Zealand ...	1st	48 0	45 6	42 0	42 0	46 6	—
Australian	1st	41 0	42 6	39 0	39 0	42 0	38 6
PORK :—							
British	1st	67 0	68 0	67 6	69 6	59 0	60 0
	2nd	59 6	58 0	62 0	64 0	55 6	51 6
Foreign	1st	64 6	55 6	53 6	53 6	—	51 6

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (*in* 1906).	Wheat.			Barley.			Oats.		
	1904.	1905.	1906.	1904.	1905.	1906.	1904.	1905.	1906.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 6 ...	26 6	30 4	28 4	22 6	24 4	24 6	15 7	16 3	18 2
,, 13 ...	26 11	30 4	28 6	22 3	24 6	24 8	15 9	16 3	18 4
,, 20 ...	27 3	30 5	28 5	22 4	25 0	24 11	15 11	16 5	18 4
,, 27 ...	26 11	30 6	28 7	22 3	25 1	25 1	15 8	16 7	18 7
Feb. 3 ...	26 9	30 6	28 10	22 4	25 0	25 1	15 11	16 7	18 10
,, 10 ...	26 8	30 7		22 2	25 2		15 9	16 8	
,, 17 ...	26 11	30 5		22 7	25 2		16 0	16 9	
,, 24 ...	27 10	30 10		22 4	25 0		16 3	16 10	
Mar. 3 ...	28 8	30 8		22 6	25 2		16 5	16 10	
,, 10 ...	29 1	30 9		22 5	25 2		16 8	16 10	
,, 17 ...	28 6	30 10		22 9	24 11		16 7	16 10	
,, 24 ...	28 2	30 9		22 8	25 2		16 7	17 0	
,, 31 ...	27 11	30 9		22 10	25 1		16 6	16 11	
Apl. 7 ...	27 10	30 9		22 5	25 6		16 5	17 0	
,, 14 ...	27 9	30 8		22 6	24 3		16 4	17 6	
,, 21 ...	27 9	30 8		22 0	24 4		16 4	17 5	
,, 28 ...	27 8	30 9		21 1	24 4		16 3	17 9	
May 5 ...	27 4	30 8		20 8	25 3		16 7	18 0	
,, 12 ...	27 1	30 8		19 10	24 10		16 6	18 3	
,, 19 ...	26 9	30 10		20 4	24 8		16 7	18 5	
,, 26 ...	26 9	30 11		19 8	24 4		16 7	18 8	
June 2 ...	26 10	31 3		18 8	23 6		16 8	19 1	
,, 9 ...	26 6	31 4		18 5	24 0		16 10	18 11	
,, 16 ...	26 5	31 7		18 2	26 0		16 8	19 1	
,, 23 ...	26 5	31 7		19 2	23 9		16 10	18 10	
,, 30 ...	26 4	31 8		18 8	23 2		17 1	19 7	
July 7 ...	26 6	32 1		19 8	22 11		17 1	19 6	
,, 14 ...	26 10	32 3		18 9	23 10		17 6	19 7	
,, 21 ...	27 7	32 2		18 10	23 7		17 6	18 11	
,, 28 ...	28 0	32 3		19 9	23 11		17 10	19 3	
Aug. 4 ...	28 3	31 11		19 9	22 0		17 10	18 4	
,, 11 ...	28 4	30 5		19 9	22 5		17 7	16 11	
,, 18 ...	28 8	28 5		22 5	23 4		16 7	16 4	
,, 25 ...	29 5	27 1		23 2	23 6		16 5	15 9	
Sept. 1 ...	30 2	26 11		25 3	23 5		16 3	15 9	
,, 8 ...	30 0	27 1		24 10	23 4		16 1	15 11	
,, 15 ...	29 7	26 11		24 9	23 7		15 11	16 0	
,, 22 ...	29 10	26 8		25 10	23 10		15 9	15 11	
,, 29 ...	29 10	26 9		25 5	24 3		15 8	16 1	
Oct. 6 ...	30 2	26 9		25 6	24 9		15 9	16 3	
,, 13 ...	30 5	26 11		25 4	24 10		15 8	16 6	
,, 20 ...	30 4	27 1		25 5	25 0		15 11	16 7	
,, 27 ...	30 6	27 4		24 11	24 11		15 10	16 8	
Nov. 3 ...	30 6	27 10		25 0	24 9		16 0	17 1	
,, 10 ...	30 3	28 3		24 6	24 10		15 11	17 4	
,, 17 ...	30 2	28 7		24 5	24 6		16 0	17 8	
,, 24 ...	30 5	28 5		24 4	24 6		16 1	17 9	
Dec. 1 ...	30 4	28 8		24 6	24 6		16 2	17 11	
,, 8 ...	30 4	28 6		24 4	24 7		16 2	17 11	
,, 15 ...	30 4	28 5		24 4	24 5		16 2	17 11	
,, 22 ...	30 3	28 4		24 7	24 6		16 1	17 11	
,, 29 ...	30 4	28 3		24 8	24 7		16 2	18 1	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1905.	1906.	1905.	1906.	1905.	1906.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	January ...	39 11	39 10	23 7	25 0	18 5	21 10
Paris:	January ...	40 7	39 7	24 0	25 5	19 4	22 6
		1904.	1905.	1904.	1905.	1904.	1905.
Belgium:	November...	31 4	30 9	22 9	23 7	21 6	20 9
Berlin:	November...	38 6	39 1	—	—	20 0	21 9
	December...	38 11	39 11	—	—	19 7	22 0
Breslau:	November...	36 6	34 9	25 7	27 5	18 6	20 1
	December...	36 3	35 3	25 7	25 1	18 10	20 0

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of January, 1905 and 1906.

—	Wheat.		Barley.		Oats.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	30 11	29 9	23 9	24 7	17 5	19 3
Norwich	30 1	28 0	24 8	24 11	15 10	18 2
Peterborough ...	30 0	27 9	24 2	24 4	16 2	18 0
Lincoln	30 2	28 3	23 4	24 6	15 10	17 7
Doncaster	30 1	27 9	23 6	23 7	15 6	17 8
Salisbury	29 2	28 5	25 7	25 4	16 3	19 3

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1906.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	16 0	14 0	—	—	—	—	15 6	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	117 0	115 0	—	—	—	—	—	—
Danish ...	124 6	122 6	126 6	124 0	127 0	122 0	126 6	—
Russian ...	109 6	107 6	122 6	120 0	108 6	105 6	—	—
Australian ...	114 6	112 6	119 6	117 6	117 0	114 6	118 0	—
Argentine ...	115 6	113 0	119 0	117 0	117 0	114 6	118 0	—
CHEESE :—								
British, Cheddar	76 6	71 0	—	—	74 0	68 0	68 0	64 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	75 0	67 0	75 0	68 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	65 0	64 0	65 6	64 0	64 6	62 0	65 6	63 6
BACON :—								
Irish	65 6	64 0	66 6	64 0	65 0	61 6	—	—
Canadian ...	57 0	53 6	52 6	48 6	55 0	52 0	57 0	53 0
HAMS :—								
Cumberland ...	102 0	100 0	—	—	—	—	—	—
Irish	107 0	102 0	—	—	—	—	94 0	84 0
American (long cut) ...	53 6	51 0	49 0	47 0	47 0	45 0	49 6	48 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	16 5	14 9	—	—	—	—	—	—
Irish	14 6	13 3	11 11	11 5	12 0	11 3	12 5	11 2
Danish ...	13 10	12 3	11 4	10 4	13 0	12 3	15 6	13 6
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	70 0	57 6	—	—	75 0	65 0	55 0	50 0
Scottish Triumph...	68 6	55 0	58 6	49 6	41 6	36 6	—	—
Up-to-Date ...	70 0	56 0	63 0	54 0	41 6	36 6	45 0	40 0
HAY :—								
Clover... ...	89 6	78 0	87 6	76 6	86 0	65 0	74 6	67 0
Meadow ...	76 6	66 6	75 0	68 0	—	—	72 0	63 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	January.	
	1906.	1905.
Swine-Fever:—		
Outbreaks	73	47
Swine Slaughtered as diseased or exposed to infection	310	170
Anthrax:—		
Outbreaks	73	86
Animals attacked	90	153
Glanders (including Farcy):—		
Outbreaks	107	99
Animals attacked	185	172
Sheep-Scab:—		
Outbreaks	96	203

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	January.	
	1906.	1905.
Swine-Fever:—		
Outbreaks	1	7
Swine Slaughtered as diseased or exposed to infection	14	18
Anthrax:—		
Outbreaks	—	—
Animals attacked	—	—
Glanders (including Farcy):—		
Outbreaks	1	2
Animals attacked	4	4
Rabies (number of cases):—		
Dogs	—	—
Sheep-Scab:—		
Outbreaks	62	75

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XII. No. 12.

MARCH, 1906. [NEW SERIES.]

STUDIES OF WEEDS.

I.—Some Common Thistles.

During the last few years, whenever opportunity has offered, I have been attracted to examine the structure and general biology of the commoner weeds which trouble farmers, in the hope that careful investigation would lead to some rational system of dealing with these pests. Apart from its utilitarian aspect, the study has proved of much scientific interest, to which, however, there is no need to refer here. The present communication deals with four of the commoner species of thistle which arrest the farmer's attention both on arable land and pasture. These are: (1) *The Spear Thistle*, (2) *The Welted Thistle*, (3) *The Marsh Thistle*, and (4) *The Creeping Thistle.* The spear, marsh and creeping thistles have each hair of the down or pappus which is attached to the "seed," branched somewhat like a feather, while the hair of the down of the welted thistle is simple.

1. The Spear Thistle (*Cnicus lanceolatus*, Hoffm.) is the strongest of the four plants mentioned, and grows usually from 2½ ft. to 4 ft. high (Fig. 1). Its root is a well-developed tap-root, which descends from 9 in. to 1 ft. into the soil, and bears few lateral roots. One or two very strong adventitious roots are often produced near the surface of the ground (Figs. 4 and 5). The upright stem is stiff, and the spines on the edges of the leaves are long and stout. There are also short stiff spines on the upper surface of the leaves, and long ones on the bracts forming the involucre of the flower-head. The flower-heads are erect and comparatively few, and are placed either

singly or two or three clustered together at the end of the branches. Each head is about 1 in. to $1\frac{1}{2}$ in. in diameter, with palish crimson-purple flowers (Fig. 10). The plant produces seeds freely, and these germinate very easily in two or three days when they are placed in suitable soil. The spear thistle as met with in the fields is usually a biennial. I have, however, flowered seedlings in one season, but such plants did not ripen seeds satisfactorily, and were destroyed by frost in the autumn.

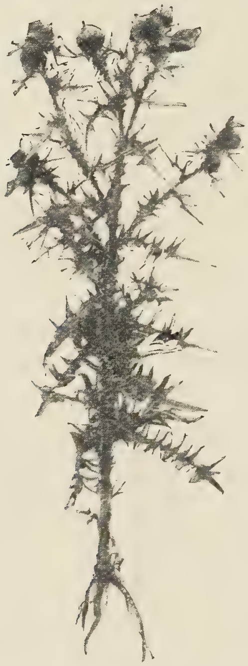


FIG. 1.—SPEAR THISTLE (*Cnicus lanceolatus*, Hoffm.).

Ordinarily the plant during the first season of growth produces a compact rosette of ovate-lanceolate leaves lying close to the ground. In the second year a central stem is sent up, which branches and bears flower-heads in which seeds are produced. After the latter are ripe the plant dies. The seeds, however, are borne away from the parent plant by means of the feathery down or pappus. The distance which the seed is carried is comparatively short, more usually less than 30 or 40 yards rather than beyond this distance, and it varies with the state of the weather. On dry, hot days the seed separates or dries off the pappus almost as soon as it escapes from the flower-head

and drops to the ground close to the plant, the pappus floating away without its load. Most of the thistle down seen floating on windy days bears no seed. The spear thistle is very common on roadsides, and in pastures and meadows on almost all kinds of soil throughout the country.

2. THE WELTED THISTLE (*Carduus crispus*, L.) is an annual or biennial plant, not so commonly distributed as the preceding one and gives little trouble to the farmer. The tap-root is

FIG. 2.—MARSH THISTLE (*Cnicus palustris*, Hoffm.).

smaller and the stems more slender than those of the spear thistle. The stem is erect, about 1 ft. to 3 ft. high, winged and covered with fine spines. The leaves and involucre are also covered with spines. The flower-heads are roundish, clustered together at the end of the branches, and bear purplish-crimson flowers. The seeds germinate very readily, and the young plants somewhat resemble those of the spear thistle.

3. THE MARSH THISTLE (*Cnicus palustris*, Hoffm.) is one of the commonest species, and is met with all through the country

on damp undrained pastures and sides of ditches (Fig. 2). The root-system of the plant consists of a series of fibrous roots all about the same thickness (Fig. 6). The stem is erect and branched, somewhat slender and soft, with numerous short spines upon its wings. Like its leaves it is a dull green or greenish-purple tint. The flower-heads are small, about ½ in. in diameter, and bear dark purplish-crimson flowers. The in-

FIG. 3.—CREEPING THISTLE (*Cnicus arvensis*, Hoffm.).

volucre is practically spineless and similar in colour to the stem. The plant is a biennial. During the first season a compact rosette of leaves is formed close to the ground, from which an erect stem is sent up in the second year. The seeds are pale straw-coloured, and only germinate satisfactorily under the peculiar acid conditions of marshy, damp soil.

4. THE CREEPING THISTLE (*Cnicus arvensis*, Hoffm.) is the commonest and most troublesome of all thistles (Fig. 3). It grows abundantly on all sorts of arable land and pastures throughout Europe. It is a perennial plant, exhibiting many

remarkable structural and biological features, to which I hope to refer in another place. The flowers have an odour very strongly resembling that of honey, and quite distinct from that of other species. In the thistles previously mentioned each flower in the head possesses anthers which bear pollen, and an ovary capable of producing seed. Moreover, in these species seed is abundantly produced in each head of flowers.

FIG. 4.—ROOTS OF SPEAR THISTLE (second year plants).

The creeping thistle has, however, two distinct types of flower-head. In one of these the flowers have abortive anthers which produce no pollen, while in the other pollen-bearing anthers are present. These two kinds of flower-heads are always borne on separate plants, and as each individual plant is capable of spreading extensively below ground and sending up stems into the air from its underground parts, distinct colonies bearing one or other type of flower-head are sometimes met with occupying comparatively large areas. A great many farmers

believe that the seed of the creeping thistle is incapable of germination. This is, however, a mistake. A certain amount of seed is produced in both types of flower-heads, but chiefly in those in which pollen is absent. The seeds germinate readily enough either in the year in which they are produced or in the following spring. The seedlings have two fleshy cotyledons, followed soon by the ordinary leaves, which do not grow in rosette form as in the other kinds of thistle. A thin tap-root

FIG. 5.—ROOT OF YOUNG SPEAR THISTLE (first year).

descends vertically in the ground, and in very few weeks—long before the cotyledons decay—adventitious buds are produced upon it (Fig. 8), and also upon the lateral secondary roots in great abundance. The root-system develops in all directions very extensively in young and old plants, and upon all parts of it buds arise which ultimately come above ground and grow into strong, leafy stems. Although the creeping underground parts, from which the thistle gets its common name, look very much like rhizomes, they are true roots, which bear buds ; no rhizomes

are produced. The stems and leaves, both of seedlings and mature plants, are very sensitive to frost. The first frosts of November and December kill off all the green parts above ground, but the buds on the roots below are uninjured, and it is from these that the plant is chiefly propagated.

METHODS FOR THE EXTERMINATION OF THISTLES.—The methods adopted for the destruction of thistles, if they are to be

FIG. 6.—ROOT OF YOUNG MARSH THISTLE.

of any use, must take into consideration the life-history of the plant. There is an old well-known rhyme which runs somewhat thus—

"Cut thistles in May
They'll grow the next day,
Cut 'em in June
They'll come again soon,
Cut in July
They'll surely die."

Now this advice to leave cutting until July is excellent so far

as it goes for the destruction of the spear, welted, and marsh thistles, but it is absolutely useless for the checking of the creeping thistle. The first four lines are true only of the perennial creeping thistle, and the last two lines only refer to the biennial species. It would conduce to better work if the rhyme could be buried and forgotten, as it suggests general advice for all kinds of thistles, and such generalisation is valueless.

(1.) *Destruction of Spear, Welted and Marsh Thistles.*—The spear, welted, and marsh thistles are all biennials in habit, and can be destroyed by the same methods. Each plant grows but two seasons, at the end of which it exhausts itself in seed production and dies. In the case of these weeds seeding must be prevented. This can be done by cutting with a spud

FIG. 7.—ROOT OF CREEPING THISTLE.

below ground, or with a scythe or sickle above ground in late June or July, when the plants have sent up their flowering stems, and before the flowers have opened. Cut at this time they die (as they would have done in another month or two in any case) and seed is not formed. This plan effectually gets rid of plants which are in their second season of growth. Seedlings must, however, be dealt with also. These are best spudded in meadows and pastures in late autumn and spring. At this time they are in the form of a rosette close to the ground. In cutting with the spud or similar instrument it is important to be certain that the roots of the plant are cut

through below the bud part from which the leaves arise. It must also be borne in mind that in the case of the marsh thistle there are a number of roots to be severed (Fig. 6), and the spear thistle and welted thistle often have more than one strong root (Figs. 4 and 5). Sometimes I have seen one of the

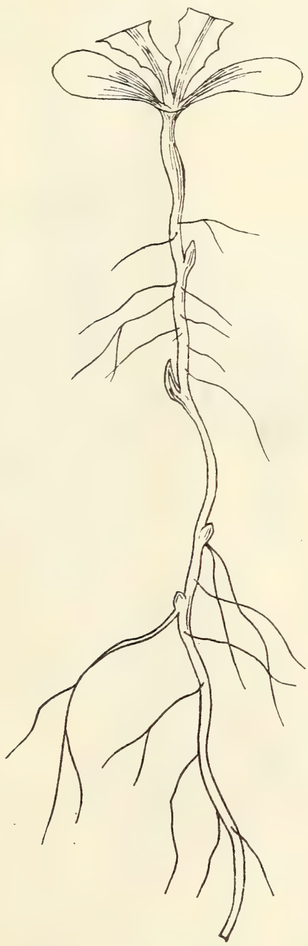


FIG. 8.—CREEPING THISTLE, Seedling 9 weeks old (slightly reduced).

roots cut and the other left, which is quite useless (see Fig. 5). To make certain of the result, the spud should be driven well below the surface of the land and the severed rosette of leaves turned upside down. It is easily done, and requires no more time than slovenly work. Cutting at these definite times of the

year, namely, in autumn and spring for the eradication of the young plants, and in June or July for the destruction of the old ones so as to prevent seeding, is all that is necessary in the case of the three kinds of thistles mentioned.

(2.) *Destruction of Creeping Thistle.*—The creeping thistle, however, cannot be destroyed by the adoption of such methods. Seeding must, of course, be prevented, but to wait until June or July before cutting is an excellent way of

1 2 3 4

FIG. 9.—FLOWER-HEADS OF THISTLES (natural size).

1.—Creeping Thistle (anthers perfect). 2.—Creeping Thistle (anthers abortive). 3.—Marsh Thistle. 4.—Welted Thistle.

keeping these pests in a state of robust health. During the summer the plants manufacture a large amount of food-material in their leaves, and this is transferred and stored below ground in the roots and buds upon the latter. Comparatively little seed is produced, and little of this stored food is needed for it. To cut off the stems after this storage has taken place has no exhausting effect on the crop, and the mowing of this kind of thistle once or twice late in the season can be practised for years without diminishing its vigour. To cope with the creeping thistle it must be cut early in the year, soon after it comes above ground, and the cutting should be repeated as frequently as possible throughout the season.

For every shoot sent above ground the thistle uses some of its stored material, and if the stems and leaves, which are the plant's machinery for making more food, are destroyed as soon as they appear, exhaustion and death certainly result. Both old and young plants must be dealt with in this way. Faithful systematic cutting with the spud or scythe in meadows and pastures throughout two seasons, or the growth of a couple

FIG. 10.—HEAD OF SPEAR THISTLE (natural size).

of root crops in succession where the weed is very prevalent in arable land, is a sure plan of getting rid of this most troublesome of agricultural pests.

JOHN PERCIVAL.

RED CLOVER SEED AND ITS IMPURITIES.

Red clover (*Trifolium pratense*) takes high rank among fodder plants, on account of the quantity and quality of its produce. It is, perhaps, the most common and widely distributed of all the clovers. There are several varieties indigenous to this country, but we are here only concerned with the two which are commonly sold in provincial markets and at Mark Lane as red clover and cow grass.

Red clover is used alone, and also forms a large proportion of many of the mixtures sown as a one, two, or three years' ley. Cow grass, or perennial red clover (*Trifolium pratense perenne*), is mainly used for permanent pasture or leys of extended duration, and differs from the first-named clover in its degree of permanence and in being a single-cut crop. When grown side by side, the difference between the two is most striking at harvest time; the aftermath of red clover after cutting is making some headway towards a second or seed crop, while the cow grass is only coming into flower, which, after cutting, produces little or no aftermath or second crop. Owing to this, the high price of cow grass seed need never occasion surprise.

Up to the present time, experts have been unable to distinguish any real difference between the two seeds, so that the description of one seed answers equally well for the other.

The seeds of red clover differ from all other clovers in commerce in form, colour, and size, and it is easy for the analyst or expert to know at a glance that he is dealing with red clover, but when he is required to determine whether a particular sample is of English growth or not, a great difficulty presents itself, and, under certain conditions, it is almost, if not quite, impossible to determine the origin. If seeds are examined in bulk, however, before they are cleaned, the presence of certain weed seeds may indicate that the sample has had its origin in England, America, Northern or Southern Europe.

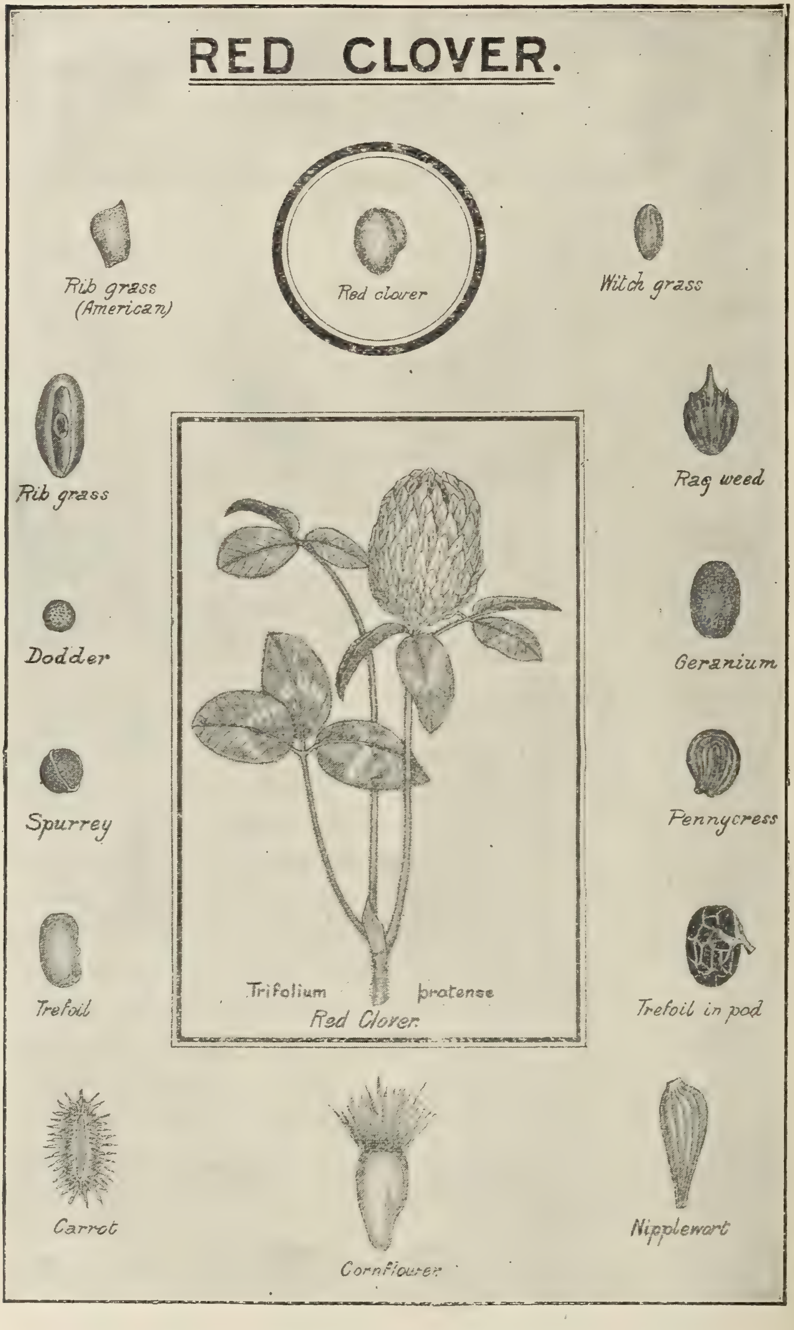
Seeds from the Southern States of North America, it may be remarked, are not looked upon with much favour in this country, for as a rule they are considered weak and tender, and not able to withstand the rigours of the English climate. This may be

true to a certain extent on the heaviest and coldest land, though, on the other hand, authentic American seed has been known to grow well and persist for years within five miles of London, holding its own against English red clover and cow grass. The writer has known of many large consignments in this country of American-grown clovers which have almost invariably given satisfaction.

The seeds of red clover are somewhat oval in shape, and in a general way slightly three-angled, the radicle of the embryo projecting prominently on one side, the colour varying even in high-class samples from light or deepish purple at the broad end shading down to a yellow or greyish-yellow at the narrow end. The evidence of immaturity, and perchance a weakened or deficient germination, is recognised by means of the number of single-seeded seed pods and by the somewhat indefinable shade of yellowish-green which the seeds exhibit. Any sample that contains a goodly number of red or brownish coloured shrivelled-looking seeds should be avoided, as they are either browned by age or by unfavourable weather conditions during harvest.

The farmer, in handling a sample preparatory to purchase, may insensibly, as it were, form a definite opinion in several ways sufficient to give him a direct and practical hold upon the quality and market value of the sample. With care, and a certain amount of experience, he can be absolutely certain whether the seed is genuine or otherwise. If the colour is good, fresh and bright, the seeds are fairly certain to be new and of last season's crop. The seeds must also be large and bold and fairly uniform in size throughout the bulk, free, or comparatively so, from noxious weeds, and entirely free from the parasite—Dodder.

It would be well for the farmer to realise that, as a general rule, the purity examination of all the seed he sows is of vital importance, meaning perhaps to him the difference between a robust, healthy crop, and a weak, straggling, diseased one. If unable to analyse the sample himself, it would be better to expend the necessary small sum required for such an examination than to risk the possible introduction of weeds and disease into his fields that years of toil may fail to eradicate. The



WEED SEEDS COMMONLY FOUND IN SAMPLES OF RED CLOVER SEED.

(Each seed drawn to scale and magnified six diameters.)

latter policy can only be characterised as "penny wise and pound foolish," as the expense of rent, labour and manure is much the same, irrespective of the crop being good or otherwise.

In the purity examination of red clover seed a separation is made under two headings—genuine seed and foreign material, and the latter is again divided into useful seeds weed seeds, noxious weeds, and mechanical impurities, such as soil, sand, &c.

In the illustration, showing the clover seeds and the impurities commonly found in samples of clover, each seed is drawn to scale and magnified six diameters. In genuine American seed we invariably find a certain number of weed seeds, which, as already indicated, help us to determine its origin. The following are shown in the plate :—Rag weed (*Ambrosia artemisefolia*), rib grass (*Plantago major*, var. *Americana*), witch grass (*Panicum capillare*), and, in addition to these, the seeds common to English or European samples, such as ordinary rib grass (*Plantago lanceolata*), spurrey (*Spergula arvensis*), trefoil (*Medicago lupulina*), carrot (*Daucus Carota*), cornflower (*Centaurea Cyanus*), nipplewort (*Lapsana communis*), penny cress (*Thlaspi arvense*), geranium (*Geranium dissectum*), dodder (*Cuscuta trifolii*).

Of all the impurities found in red clover, dodder is the one most to be dreaded. It is a parasitic leafless plant, which derives all its sustenance from the clover, around the stem of which it twines. The seed germinates in the soil in the usual way, giving rise to a tiny leafless, thread-like shoot. At first it seems as though the plant depended on the nourishment provided by the food in the soil, but should the young dodder plant fail to come into contact with a living clover plant it soon withers and dies. When the thread-like shoot touches a clover stem it immediately begins to twine round it, at the same time sending into the stem at the points of contact roots or suckers. As the growth increases, the dodder encircles not only the branches of the plant with which it first started into existence, but also other plants, and thus the work of strangulation goes on. The reddish-yellow colour of the thin, straggling, wiry stems is sufficiently characteristic and distinctive to enable one to recognise it readily. Red clover containing dodder should never be

purchased, however tempting the appearance of the sample and the price at which it is offered may be.

The seeds of the dodder of clover are grey, brown, or yellowish-brown in colour, and are very much smaller in size than the seeds of red clover, and while there is no difficulty whatever in farmers purchasing seeds absolutely free from dodder from seed houses of recognised reputation, he—the farmer—in his own interests, may adopt the added precaution of procuring an authentic sample of dodder to make himself perfectly acquainted with its appearance. By the use of a small sieve having eighteen or twenty meshes to the inch, and by scrutinising carefully the screenings with a hand lens, he will be able to satisfy himself as to the freedom from dodder or otherwise of the sample he intends to purchase.

Although the farmer from his own knowledge and experience may be perfectly satisfied from the appearance of the sample of clover he intends to purchase that it is genuine or true to name, and absolutely pure, yet that is not all. If the seeds fail to respond to the germinating test and produce living healthy plants, the purchase is a failure, and the seeds dear at any price.

The methods and apparatus employed in the principal seed-testing laboratories in Europe vary considerably, and seeds may be germinated on moistened felt, blotting-paper, flannel, sterilised sand, porous tiles, &c. In a degree, however, the medium employed is of secondary importance in the case of many seeds, provided the operator is able to exercise control over the amount of moisture, heat, and air. *Moisture* is necessary so that the food-stuffs in the seed may be brought into solution and made available for the embryonic root and shoot. *Air* is necessary to the vital processes, as the elongation of the root and shoot necessitate absorption and consumption of the oxygen of the air.

With regard to *heat*, the temperature at which germination is, as a rule, most rapid and safe is 68 deg. F., but in some instances seeds tested at this temperature are transferred for six hours daily to an incubator having a temperature of 86 deg. F. In the case of clovers, two or three samples of 200 seeds each are put in the incubator on blotting-paper, felt,

or tiles, the germinating energy of red clover being noted from the third day, and the test is discontinued when the sample has been in the incubator or germinator for ten days.

If the farmer feels disposed to test the germinating capacity of seeds himself, he can do it in a very simple way by counting 200 seeds and sowing each hundred separately in two small flower-pots, which may be placed in an ordinary greenhouse Another way, by which the result may be arrived at more quickly, is to place the seeds between folds of wet blotting-paper, moistened flannel or felt, and then place them between two plates or saucers near the kitchen stove. By this method the farmer will find (provided that the conditions as to moisture, air and heat are approximately right and the seeds new) that sprouting will doubtless begin on the second day, and by the third day one-half to three-fourths, or even more, will have commenced to grow.

The farmer cannot judge the real cultural worth of any sample either by its appearance or by the price he has paid for it, but he can easily form an opinion when the purity and germinating capacity is disclosed. The intrinsic value is determined by multiplying the percentage of pure seeds by the pure seeds capable of germination ; thus, if a sample is 90 per cent. pure and germinates 80 per cent., the real or cultural worth to the farmer would be $\frac{90 \times 80}{100} = 72$ per cent. real worth, which means that in every hundred seeds seventy-two are true to name and capable of germinating.

In the handling and cleaning of seeds somewhat primitive methods still prevail in many small country towns and villages in the United Kingdom, and the sale of seeds of the quality stated is by no means exceptional, but it would be well to point out that in purchasing seed of 72 per cent. value the farmer has the doubtful privilege of paying for 28 lb. of dead seed, weed seed, and rubbish out of every 100 lb. at the same price as good seed. The purchaser is fortunate if it is only dead rubbish, and not the living seeds of obnoxious weeds.

D. FINLAYSON.

THE NOVAR SYSTEM OF COMBATING LARCH DISEASE.

Over the whole of Scotland and a great part of England and Ireland, profitable forestry may be said to be regarded as inseparable from the successful growth of the common larch. But, unfortunately, in many districts this tree has of recent years proved so susceptible to the attack of a fungal disease that it can no longer be depended on to give a full crop of timber, and resort has been had to several sylvicultural systems with a view to preventing or mitigating the trouble. The practice that has been most generally recommended is to mix the larches with some dense-crowned species (spruce, silver fir, Douglas fir, or beech), the intention being to surround each individual larch with other species immune to disease, so that should the parasite appear on any particular tree the chances of the spores spreading to other trees of the same species would be reduced to a minimum. Incidentally, this system possesses the additional advantage of associating the larch — a thin-crowned, light-demanding tree—with other species having dense foliage. As a consequence the ground is more completely shaded, weeds and ground vegetation are suppressed, and the area is furnished with a thick covering of dead leaves (forest humus), which greatly improves the conditions of growth for the larch. Undoubtedly such a system of management has proved an advantage to the larch, but it has not in all cases sufficed to protect this tree against disease. Moreover, it is evident that if each larch is to be effectively isolated in this way only a comparatively small number of plants of this species can be accommodated on an acre, and if the local demand for the other species is unsatisfactory, the financial result of the system as a whole may leave much to be desired. Such a system of mixing, too, tends to the production of coarse timber by the shade-bearing species, whose lower branches are not killed sufficiently early under the mild shade of the larch.

Dissatisfied on the whole with the results of even-aged mixing of the larch with other species, Mr. Munro Ferguson, of Novar, has for some years practised a system in his extensive woods in Ross-shire which promises to provide a satisfactory solution of

the difficulty. He now plants pure larch woods, and when the trees are sixteen to twenty years old he removes all the stems except the soundest and most promising, of which 300 to 500 are left per acre. Needless to say, the system is inapplicable to cases where all, or practically all, the trees are attacked by disease at this early stage, but instances of such virulence are, on the whole, of rare occurrence. The trees that are retained are the picked stems of the three to four thousand originally occupying the ground, and measure up to 51 ft. in height and 4 to 8 in. in diameter at breast-height. Stems that are sound, or fairly sound, at this stage are not likely to suffer much from disease in later life. The thinnings removed realise £20 to £25 per acre, giving a return therefor of fully £1 per acre per annum from the time of planting. The thinning is done as early in autumn or winter as possible, and the next step is to knock off all the lower dead branches of the trees that are retained. This is a rapid process, and is accomplished by means of a pole some 8 ft. long. The "top and lop" of the felled larches, along with the dead branches cleared off the standing stems, are then thrown together into small heaps and burned.

Owing to the shading of the dense crop of larch the surface of the ground is clear of all grass and similar vegetation, and is in a very suitable condition for the reception of fresh plants. Without loss of time the area is stocked with an underwood which, of course, must consist of species that can endure the shade of the 300–500 larches that have been retained. Mr. Munro Ferguson at first used the Norway spruce, silver fir, and beech, but was not satisfied with the results obtained with any of these. The Norway spruce was found to grow very slowly under the circumstances indicated, while the silver fir in this particular locality is so much attacked by aphis (*Chermes abietis*) as to be very uncertain in its growth. Better results were obtained with the beech, and although this tree is now superseded by other species, it will probably be found to be the most suitable for use on the chalk, and on calcareous soils generally. But for some years Mr. Munro Ferguson has been experimenting with other shade-bearing trees, and has found that *Picea sitchensis* (*Abies menziesii*), Douglas fir, *Tsuga mertensiana*, *Thuja gigantea*, *Cupressus lawsoniana*, and *Abies grandis*

are far superior to the three species previously mentioned. These he raises from seed in the home nursery and plants out, for the most part, as two-year seedlings—to some extent as three-year-old transplants—when they cost him but little more than the commoner forest trees. The surface of the ground being in fine friable condition, the underwood is introduced by dibbling, a wooden tool 2 ft. in length and triangular in cross-section covered with sheet-iron being used for the purpose. Working with this a man can easily plant 1,000 trees in a day. The rate of growth of the species employed averages a foot to a foot and a-half per annum, and in six to ten years the underwood or second storey is practically covering the ground, with the crowns of the upper storey of larch about 50 ft. above. The intention is to repeat the thinning of the larch in about fifteen to twenty years from the time of the introduction of the underwood, when the number of larches left will vary from 100 to 200 per acre. At sixty to eighty years, depending on the locality, the state of the markets, and the condition of the crop, the larches will all be removed, when, if prices remain as at present, a return from them of £100 to £150 per acre may be expected. What the value of the underwood at this stage may be must remain a matter for conjecture, but even if it be inconsiderable the financial results of the rotation cannot fail to be satisfactory. Needless to say, the system as just described cannot possibly be practised except in the absence of hares, rabbits, and deer, which at Novar, owing to unremitting attention, are practically non-existent.

The various items of cost per acre may be summarised as follows :—

	£	s.	d.
Burning the surface herbage preparatory to planting	0	2	6
3,500 two-year seedling larch at 6s.	1	1	0
Planting (dibbling or notching) at 3s. per 1,000	0	10	6
Beating up, say 500 larch, three years old at 12s. per 1,000 ...	0	6	0
Planting ditto at 3s. per 1,000	0	1	6
Keeping down rank herbage in certain parts	0	2	6
Total cost per acre of establishing the larch wood	2	4	0
3,000 two-year seedling Douglas firs or other species at 10s. ...	1	10	0
Planting by dibbling at 3s. per 1,000	0	9	0
Beating up, say 200 three-year-old plants, at 15s....	0	3	0
Planting ditto at 3s. per 1,000	0	0	7
	£2	2	7

These items of cost doubtless seem very low to many planters, but on ground similar to that at Novar there is no reason why they should be exceeded. The soil is a light loam which grows rather rank heather and grass, and if the spring is at all favourable the surface herbage is carefully burned off before the larches are planted. This enables small plants to be used, and permits of their insertion by dibbling or notching. There being no rabbits or hares there is no expense for netting, while the cost of fences against stock is relatively a small item, the woodlands being in large enclosures.

AGRICULTURAL CREDIT IN GERMANY.*

The spread of co-operative ideas in Germany during recent years has been very marked, and nowhere, perhaps, have they been received with more favour than in the agricultural world. In 1888 there were 4,821 co-operative societies of all kinds, ten years later this number had increased to 16,069, while, according to the *Statistisches Jahrbuch*, they numbered 23,221 on 1st January, 1905, with a membership of 3,409,871. These included 14,272 co-operative credit societies with a membership of 1,901,000, 1,595 societies for the purchase of agricultural requisites, 3,062 societies for the manufacture of dairy and other products, 682 other agricultural societies, while the remainder were industrial and other societies not distinctively agricultural.

Credit societies, it will be seen, represent the most popular form of co-operation, and account for 61 per cent. of the societies and 56 per cent. of the total membership.

Some part of the success which has attended their formation in Germany may be attributed to the financial support obtained by the formation of central banks, devoting themselves more or less exclusively to co-operative business.

The development in this direction, which has not previously been dealt with in this *Journal*, possesses many features of interest.

There are two classes into which the credit banks may

* See also articles on "Agricultural Credit Banks," May, 1905, p. 96; "Agricultural Credit in France," June, 1905, p. 149, "Village Banks in England," June, 1905, p. 154; "Agricultural Credit in Hungary," July, 1905, p. 210; "Agricultural Credit in Belgium," August, 1905, p. 279.

broadly be divided : those founded on Schulze-Delitzsch system and those based on the Raiffeisen principle. The difference between them has been frequently explained, and it will be sufficient here to indicate the distinction somewhat briefly.

Schulze-Delitzsch Banks. — The Schulze-Delitzsch Credit Societies were designed by their founder, after whom they are named, mainly for the benefit of mechanics and small tradesmen. They grant loans on promissory notes and bills for short periods of from three to nine months, and at the same time encourage their members to deposit their savings with the society. At the time of their foundation they rested on the principle of unlimited liability, but in later years limited liability was also introduced, especially as their accumulations of capital increased. Unlimited liability and self-help were, however, declared by Schulze in 1858 to be the only principles justifiable in economy, and, moreover, "particularly suitable to the character and manners of our people." As a matter of fact, the collective liability of the members to the extent of their whole means was at that time the only system recognised by the law, but by an Act passed in 1889, the limited liability of members was admitted. A new form of unlimited liability, by which the member's risk was rendered more remote, was also introduced, but has been but little adopted.

In the Schulze-Delitzsch societies every member subscribes a certain share of the capital, no one being allowed to exceed a certain limit. This is payable in one sum or in monthly instalments. Loans are granted to members only, without enquiry as to the purposes for which they are required, on security, which may take the form of mortgages, guarantee by another member, bills, &c. They are only granted for short terms, and this is one of the features which distinguish these associations from those on the Raiffeisen principle. Deposits are received both from members and from other persons, and these, together with the small capital, form the fund from which loans are made, while the credit due to the unlimited liability of the members enables these societies to raise any money which may be required in addition. The societies are usually established in towns, but are open to anyone, regardless of place of residence

The rate of interest on loans demanded by these banks is

higher than that required by the Raiffeisen associations, and they are not so generally adapted to agricultural requirements as the latter. It would be a mistake, however, to suppose that they do nothing for agricultural credit, as, according to the figures for 1902,* 28½ per cent. of the members were peasants and farmers, 24½ per cent. mechanics, and 10 per cent. merchants and dealers. The number of societies belonging to the Schulze-Delitzsch Union was 899 with 533,888 members.

Raiffeisen Banks.—The loan and savings banks founded by Raiffeisen may be said to have three main objects: (1) to encourage thrift among the agricultural population; (2) to satisfy the demand for loans on personal security; and (3) to act as bankers in the country districts. They rest to an even greater extent than the Schulze-Delitzsch societies on the principle of solidarity or unlimited liability, in that practically no share capital is raised, the money for working the society being obtained from entrance fees, subscriptions and deposits, and borrowed from persons outside the society on the collective security of the members. Loans are advanced only for reproductive purposes, evidence being required of a reasonable prospect of repayment at the date fixed, and they must be guaranteed by another member of the society. The operations of these societies are limited to small areas, usually a village or small town, so that the personal character and circumstances of applicants for loans may be known to the members and committee. The administration is honorary, no salaries being paid (except a trifling sum to the secretary), and all profits realised go to a reserve fund.

Banks with Limited Liability.—The foregoing classes of associations depend on the joint and several liability of the members for any losses incurred by them, but since the passing of the Act of 1889 the establishment of co-operative societies with limited liability has become possible. The system has of late been more largely adopted, and at the beginning of 1905 there were 1,623 credit societies with a membership of 356,000 on this basis out of a total of 14,272 societies. Societies of this class exist to a considerable extent in Pomerania and Prussian Saxony, where the principle of unlimited liability has not been

* *Jahr-und Adressbuch der Erwerbs-und Wirtschafts-genossenschaften,* 1904.

regarded with favour. Dr. O. Rabe* observes that in Prussian Saxony, "where there is a mixture of large, medium, and small properties, unlimited liability is not suitable, as it puts too heavy a burden on the man of property for the benefit of those of smaller means. The view that unlimited liability confers greater authority and credit on co-operative societies is not correct. For what does a co-operative society with unlimited liability represent when, as a general rule, only persons of small means have joined as members?"

The German system of limited liability as applied to co-operative societies differs, however, in some respects from the English conception of limited liability. The amount of shares and liability guarantee to be taken is not left to the free will of the members, but compulsorily apportioned to the means of the individual members; thus members are required to take one share for every £100 for which they are assessed to property tax, and for every share they must undertake a guarantee of £10. That is, they go bail for the liabilities of the society to the extent of one-tenth of their possessions. The credit accorded to each individual member is measured by the amount of his guarantee. Thus a member holding fifty shares guarantees the liabilities of the society to the extent of £500, but he will not be allowed credit for £500, but only for about £375, without further security, and for advances beyond this sum he must give a bill or personal sureties. Dr. Rabe, writing in 1901, observes that during the twelve years these banks have been in existence none have failed, no losses whatever have been recorded in connection with them, and they have rapidly gained the confidence of the population. The value of each share is put at five shillings.

Central Banks.—It will be understood that the first need of these societies, whether Schulze-Delitzsch, Raiffeisen, or limited liability, was to borrow money on the cheapest terms, and afterwards, as their reserves and deposits accumulated, to arrange some means whereby any balance in the hands of one society could be used to satisfy the wants of another. From a very early period, therefore, the need of a central organisation

* "Co-operative Agricultural Credit in Germany." Bull. No. 2, Misc. Series, Dept. of Agriculture for Ireland.

began to be realised. Isolated from each other, and, in the case of the Raiffeisen banks, necessarily confined to small areas, with correspondingly small funds, they were hardly in a position to fulfil the expectations entertained of them, and a consolidated body was felt to be a necessity. With this object provincial central banks were formed by combinations of societies, and some of these were afterwards affiliated to still larger institutions, such as the Central Bank of Neuwied. It will be easily understood that the centralisation of co-operative banking was a matter of some complexity, and that the measures taken by the various societies were by no means uniform. A detailed description will be found in a series of reports presented to the International Co-operative Congress at Budapesth, to which those interested in the subject should refer. The following general summary indicates, however, some of the main features:—

The Central Bank of Neuwied.—In the case of the Raiffeisen societies, the first central bank was formed at Neuwied, in Rhenish Prussia, in 1872, by eleven societies. In 1876 it was re-formed as a joint-stock company with a share capital of £12,500, which was gradually raised until in 1900 it stood at £500,000, of which £415,000 had been paid up in cash by 3,754 affiliated societies.

This organisation, known as the "Landwirtschaftliche Centraldarlehenskasse für Deutschland," besides carrying on the business of a banker, also buys agricultural requisites and sells produce for the benefit of its societies. The funds required are provided by (1) the share capital; (2) the deposits received, or loans raised if possible for long terms; (3) the commissions charged and the margin of interest; (4) proceeds of the sale of goods; and (5) bonds and debentures not made redeemable at will. These funds are employed for advances in current account to the branch banks and societies which are members, as working capital in the sale and purchase business, and for discounting bills and advancing money on security.

Business between the bank and its societies is conducted by branch banks, but every shareholding society is directly represented at the general meeting, which elects the board of directors. Each district in which there is a branch bank has

its own advisory board and local committee of management, as well as managing directors of the branch banks. The latter are on the committee of management of the central bank.

The co-operative character of the central bank is maintained by restricting the dividend to 4 per cent. on the paid-up capital, which goes only to the co-operative societies which are members, the balance remaining being carried to reserve.

Each branch bank may give credit to a society up to 10 per cent. of the property of its members, and the main business of the central institution is to equalise the supply and demand of money, which is done in this way: should a branch bank require funds it telegraphs to the central bank, which at once assigns to it funds at its banking account with the Prussian Central State Bank. Excess cash held by the branches is in the same way paid to the credit of the central bank.

The magnitude of the operations of this institution may be gathered from the fact that the turnover in 1903 amounted to £15,350,000, and the assets to £3,240,000. The profits only amounted to £12,000, out of which a dividend of 3 per cent. was paid.

Other Central Banks.—In addition to the twelve local central banks acting as branches of the Central Bank of Neuwied, there are twenty-two provincial central banks affiliated to the Union of German Agricultural Co-operative Societies, presided over by Dr. Haas, of Darmstadt, and in addition some half-dozen central banks outside the Union. These banks represented approximately 8,500 societies, but this number includes some societies other than credit societies, which, taken by themselves, probably number about 7,300. Each of the central banks, however, forms a separate entity, the action of the Union being confined to audit and inspection.

Briefly, these central banks have adopted the system of limited liability referred to above, viz., that of issuing small shares carrying a comparatively heavy liability, and the credit allowed by them to their affiliated societies varies but bears a relation to this liability, generally in excess. The working funds are derived from the small share capital, from deposits, and from the Prussian Central State Bank, which advances them money on the security of their members' liability to an amount not exceeding ten times

the paid-up share capital. According to figures quoted by Herr Heuzeroth in an article prepared for the Sixth Congress of the International Co-operative Alliance, the share capital of the twenty-two banks within the Union amounted to £213,000, and the loan capital to £2,897,000, made up of drafts on the State Bank, £654,000, and deposits from local societies, about £2,000,000.

It may be noted that during the past year an amalgamation has taken place between the Darmstadt Union and the Raiffeisen organisation at Neuwied, by which the supreme control of both organisations will be vested in a central committee. The terms of the Union have been so arranged as to secure the continued existence within it of the special institutions of the Raiffeisen type.*

The German Co-operative Societies Bank.—It will be seen that the central banks above described, both that at Neuwied and those affiliated to the Darmstadt Union, obtain credit by pledging the combined liability of the societies which they represent. In the case of the Raiffeisen banks, represented by the first-named institution, the liability of all the members of all the societies to make good the debts of the central body is unlimited; in the case of the second class of central banks the liability of the societies is limited to the amount of their guarantee. This principle, however, never met with the approval of societies of the Schulze-Delitzsch type, which took the view that a central bank should be an independent institution whose actions would not under any circumstances jeopardise the welfare of the societies. With this object the German Co-operative Societies Bank was formed as a joint-stock company in 1864, with a capital of £40,000, which was gradually increased to £1,500,000. Its operations have not been confined to credit societies, though it naturally made a special feature of co-operative banking, and its essential principle has been that it dealt with the Schulze-Delitzsch banks without favour on distinctly business lines. As may be gathered from its increase of capital, it met with very considerable success, but the extension of banking business in Germany made its amalgamation with some more powerful institution desirable, and it has recently been absorbed into the Dresdner Bank.

* *Journal* of the Irish Dept. of Agric., Oct., 1905.

The Prussian Central State Bank.—It now only remains to notice the action taken by the Prussian Government for the assistance of co-operative banking by the foundation in 1895 of the Prussian Central State Bank. The funds placed at its disposal were at first £250,000, which was increased in 1896 to £1,000,000, and in 1898 to £2,500,000. Dr. Heiligenstadt, the president of the bank, in a memorandum on the subject, thus explains the view taken by its promoters : " When dealing with co-operative organisations, even by the comparatively easy method of current accounts, the great banking institutions of the country obviously cannot forego the condition of demanding adequate bankable security. Bankable security, however, is just what co-operative institutions are rarely in a position to supply to any considerable amount, because in co-operative institutions the formation of capital or pledgeable assets is by the very nature of things slow, and need is sure to be greatest where such formation is least developed. And this hindrance may be said to hamper even societies of old standing, in which the creation of capital has been in progress for some time, and which have as a rule succeeded in some measure in adapting themselves to the requirements of the banking market. In more recently-formed societies, more particularly in agricultural districts, the obstacle is painfully in evidence. Such societies are only very rarely in a position to satisfy bankers' requirements at all. The Prussian Central State Bank was formed to bridge over the existing chasm and bring demand and supply together by interposing between them a powerful institution which, having no selfish interest of gain or profit to study, might be employed to satisfy the needs of personal credit on reasonable conditions in the case of the lower and middle classes when combined for productive purposes in co-operative societies."

The State Bank only advances money, except on tangible security, to unions of co-operative societies, such as central banks, &c., and not to individual societies. In the case of unlimited liability societies the advances are limited to 10 per cent. of the total value of the property involved, and in the case of limited liability to something less than the actual sum guaranteed.

At the close of March, 1904, the bank had business relations

with fifty-two central banks, nineteen of which were mainly urban and industrial, representing 405 societies and 80,563 members, while thirty-three were rural and agricultural, representing 8,940 societies and 807,101 members. The balance-sheet showed that it held £393,664 on current account and £1,370,684 on deposit, and had £1,877,118 outstanding for advances on bills of exchange, &c. The net profits amounted to £110,000, or 4·41 per cent. on the capital. The bills discounted in 1903 amounted to £3,957,000.

In several other German States, *i.e.*, Bavaria, Saxony, and Wurtemburg, the Governments, without actually establishing State banks, have given subventions or some form of financial assistance to a central co-operative bank, and claimed a reasonable amount of representation in the management.

Improvement of Cereals in France and Sweden.

British barley growers may be interested to know that the French Society for encouraging the cultivation of brewing barley have recently taken steps with a view to the improvement of native French barleys in a way somewhat similar to the action of the Home-Grown Wheat Committee in this country.* For more than ten years this society has undertaken the introduction and distribution in France of the best known varieties, and has carried out experiments as to the influence of manures and of methods of cultivation on the chemical composition of the grain. The results obtained showed many instances of the more or less rapid degeneration of the best seed, but, on the other hand, they gave prominence to the great value attaching to seed originating from the Experimental Seed Laboratory at Svalof, in Sweden. One of the most striking features of this seed, according to an article in the French *Journal Officiel* (Dec., 1905), was the uniformity in germination, in flowering, and in maturity of the plants it produced. All the individuals of the same lot grew to practically the same height and size, they ripened together, and as they were all of equal maturity when harvested they germinated simultaneously when malted. This uniformity of germination was found greatly to

* See Bull. Soc. Nat. d'Agric. de France, 1905, No. 9, p. 859.

increase the value of the grain for brewing purposes; it was not, on the one hand, lost by late germination, nor did it prove injurious to the beer by too early sprouting.

In view of the quality of the malt prepared from these barleys, the French Society resolved to adopt the method of botanical analysis, which appeared to have been attended with such successful results at Svalof, with a view to the improvement of French barleys. They have secured the services of a botanist, M. Blaringhem, who has made a special study of the Svalof methods, and a series of experiments is now being carried out under his direction.

The Svalof Seed Laboratory* was founded in 1886 by a number of landowners and farmers, with a view to the improvement of the principal cultivated crops, and it still preserves its private character and independence, though of late years it has been subsidised by the State. At the time of its foundation the method adopted was that of improvement by "selection." Plants which exhibited exceptional qualities of yield, of chemical composition, of uniformity of germination, of resistance to frost and disease, were selected and cultivated under the most favourable conditions, but experience showed that these qualities were not transmitted under ordinary farming conditions. Subsequently the selected plants were grown without any special treatment, but although an improvement in the plants was effected, it did not take place to the extent which was anticipated. Attempts at improvement by selection were therefore abandoned, and other means were sought, which gave hopes of obtaining a practical result within a reasonable time. It was seen that in the method of selection practised up to that time the cereals bred from had shown too great a tendency to variation, with insufficient powers of hereditary transmission. After many experiments, the conclusion was reached that most plants transmitted their own individual characteristics in a high degree, and if bred from further, without cross-fertilisation, showed but little tendency to variation. To avoid variation, therefore, it was necessary to adopt a system of pure pedigree breeding, and from this time plants were grown springing from

* Accounts of the work of the Svalof Laboratory will be found in *Wiener Landw. Zeitung*, 26th April, 1905; *Der Wettbewerb der dänischen und der schwedischen Landwirte mit Deutschland*, 1904; *Bull. du Muséum d'Histoire Naturelle*, Paris, 1904, No. 7.

one mother plant or ear, increase being obtained strictly from the produce of this one foundation stock. Under this system the main point was to obtain as a mother plant a natural variation presenting desirable qualities, whose variation from the normal was of an hereditary character. This method proved very successful, and the produce of the carefully selected mother plants showed a surprising homogeneity in their botanical and physiological properties, with the result that a number of new varieties of grains were produced and placed on the market.

A special feature of the Svalof method was a system of classification depending on certain fixed botanical characteristics, by means of which the plants under cultivation were divided into certain minor classes or species. The system by which this principle is worked has been very carefully devised. Each person engaged at the station has only one, or at the most two, sorts of plants to deal with, and thus becomes so familiar with their characteristics that the slightest deviation from the normal type can hardly pass unnoticed. In order to classify the plants systematically they are grouped in a number of fixed types; thus in the case of barley there are four sub-species of the three species generally cultivated, viz., *Hordeum distichum nutans*, *H. distichum erectum*, and *H. tetrastichum*, so that there are twelve classes in which the seed may be grouped. The four sub-species depend in each case on small, and to a large extent microscopical, differences in the seed, which, however, have been found to be completely hereditary; thus the grain of *H. distichum nutans* has seed with an oblique or sloping base, but may have either long or short hairs or bristles on the rachilla, and each description may have either smooth or indented nervures. The seed of the other species is similarly classified. Wheat is divided into seven types, oats into ten, peas into nine, and vetches into nine. The cultivation of rye and potatoes has only recently been taken up, and the types have not yet been fixed.

In view of the great number of foundation stocks in cultivation, it is naturally not sufficient to class them merely in one or other of these sub-species, and a further step towards identification is necessary, so that all the characteristics of a mother plant may be satisfactorily established, and by following its subsequent

career its powers of hereditary transmission ascertained. Each lot, therefore, is separately grown, and the results accurately defined and recorded in regard to such points as weight of the plant, straw, husk, ear and grain, length of the stalk, and length and closeness, or compactness, of the ears. By the latter term is to be understood the number of spikelets on every 100 millimetres of rachis, or the main axis of the ear, and to facilitate the determination of the number a very useful instrument, known as a "classifier," is employed. Many other mechanical appliances are also in use which help to make the work of sorting and measuring the grain less laborious, and the results are tabulated in a way which at once enables deviations from the normal type to be recognised.

As the object of the station is to obtain an improvement in the quality and quantity, the constant aim is to ascertain whether any new form which may occur possesses desirable qualities. The first cultivation of any sample is for purposes of "observation," and the plots are very small. In the next year, the seed, if it is found uniform in character, is placed in another category called the "control." Here larger plots are employed in order to ascertain the persistence of the selected characters, *i.e.*, whether it breeds true to type. This may be done for one, two, or more years, after which those sorts which seem very promising and adapt themselves to the conditions of soil and climate and show themselves resistant to insect and fungoid pests, may be cultivated on a larger scale still under the control of the Svalof Station, with a view to the production of seed for sale.

From the foregoing, it would seem that the principal novelty in the Svalof system at the present time is the system of classification in sub-species, together with the elaborate measurement and tabulation of other features in the pedigree stock.

Sprouting Seed Potatoes.

For many years the growers of early potatoes have been in the habit of storing their potato seed in trays or boxes in thin layers, in order that the tubers should sprout before being planted, but it is only lately that the boxing and subsequent sprouting of late potatoes have been found to be profitable.

The experiments on this subject carried out by the Irish Department of Agriculture, which were reported in this *Journal* (Vol. XI., p. 673, February, 1905), showed that the increase due to sprouting varied in 1903 from 10 cwt. to 3½ tons, and in 1904 from 13 cwt. to over 6 tons. The increased yield in the latter year averaged 2 tons 13 cwt. per acre, representing over 25 per cent. on the average crop from unsprouted seed, and in only two cases was there a decrease.

A similar experiment was carried out in 1905 by the Aberdeen and North of Scotland College of Agriculture at nine centres with a view to ascertain if the sprouting of late potatoes in the comparatively late climate of the north-east of Scotland would be profitable. From these trials it may be fairly assumed that this system is likely to prove advantageous with late varieties and in a late district in a year like 1905. The advantages of sprouting are summarised by Mr. R. B. Greig in his report on the experiment as follows :—(1) In a normal year the crop is heavier ; (2) there are fewer small and more saleable tubers from sprouted sets ; (3) in a late spring sprouted sets may be planted late without a reduction of crop ; (4) where autumn frosts occur little damage will be done, as the potatoes from sprouted sets will be more mature ; and (5) a crop from sprouted sets may be raised sooner than a crop from ordinary sets.

The disadvantages are perhaps equally obvious.

1. There is first the initial cost of the boxes. Potatoes will sprout on a floor or in any kind of box, but the most convenient size of box is 24 in. long, 12 in. wide, and 3 in. deep, with corner pieces 7 in. high, so that the boxes can be piled on each other to any height without interfering with ventilation. It is of importance that there should be a cross handle fixed into the side pieces for convenience of carrying. Such boxes will hold about 20 lb. of potatoes, and can be purchased in Aberdeen at 30s. per 100.

As 100 boxes are sufficient for one acre and the boxes will last several years with ordinary care, the cost is spread over, say six years, and is therefore 5s. per acre.

2. A storage space is a difficulty where a large area is planted, but where only a few acres are grown, or on crofts, the boxes may be stored on the couples of the byres or cattle sheds, and the sets will do quite well there.

3. More labour is required at planting, but the difference as compared with the ordinary method is very little, and where the boxes described above are used it is scarcely appreciable.

Treatment of the Sets.—The potatoes for seed may be placed in the boxes when lifted in the autumn, or they may be removed from the pits any time in winter. They require no arrangement, but are simply scattered in the boxes in one or two layers, without earth. When the sprouts are about 2 in. long, growth may be stopped and the sprouts toughened by exposure to light. When hardened in this manner the sprouts do not break off easily and the sets may be dropped in the drills in any position. It is not advisable to cut sprouted sets, and the best size for boxing is about 1½ in., or what would pass through a 1¾-in. riddle and be retained by a 1¼-in. riddle.

Turnips Attacked by Ceutorhynchus Beetle.

An instance has recently come under the notice of the Board of injury to turnips by a *Ceutorhynchus* beetle, *C. contractus.* This is a very tiny shining black beetle which on occasion in past years has been known to cause very great loss to sowings of turnips and white mustard. The beetle works both below and above ground. It measures up to one-sixteenth of an inch in size, and has a small proboscis by which it wounds and punctures.

The injury caused by its operations is accomplished in one of the following ways:—(1) The newly sprouting seed may be attacked; (2) the hypocotyl may be bitten so that the parts above wither; (3) the seed leaves may be wounded before reaching the surface; (4) the seed leaves may be wounded after coming above ground, either by holes being bitten in them or by injury that does not immediately result in a hole. The attacked plants, of course, die off.

Details are lacking as to the complete life-history of this beetle, but there is a record of its grubs being found in galls on the roots of charlock. This will give an indication of one means of guarding against it. Recently, however, it has been found that an excellent preventive is to steep the seeds in paraffin before sowing. Seeds steeped for two hours and then

sown were found not only to germinate well, but the resulting plants were excellent and were untouched by the beetle, whilst others from untreated seed—in a neighbouring drill—lost colour and showed a number of brown marks. A record of these experiments will be found in this *Journal* (Vol. XII., April, 1905, p. 38).

Manurial Effect of Bone-Meal.

Experiments which have been carried out with bone-meal in comparison with other phosphatic manures have frequently shown that the action of the phosphoric acid in bone-meal is as a rule less than it is when in the form of superphosphate, although in many instances the reverse has been found to be the case in actual practice. Professor Söderbaum, of Stockholm, has recently published the results of some experiments in this connection which are of considerable interest.

It was pointed out in 1900 by Kellner and Böttscher that the experiments which gave results unfavourable to bone-meal were made either on soils which were naturally strongly calcareous or on those to which carbonate of lime had been added. They found, in fact, that the effect of bone-meal was much less on calcareous soils, or on soils manured with lime, than on unlimed soils, and that the manurial action of the phosphoric acid in bone-meal depended very largely on the lime-content of the soil. After attention had been directed to this point, pot experiments were carried out, which gave results favourable to bone-meal, though a smaller crop was still obtained than after superphosphate or basic slag of a corresponding quality.

This fact admitted of two explanations. On the one hand, it could be assumed that the bone-meal, in consequence of its slow solubility, hardly ever exercised the same phosphatic action as superphosphate; at any rate, not on plants such as spring grain, with only a short growing period. On the other hand, there was the possibility that besides the lime-content of the soil there were other factors still unexplained which were able to increase or decrease the action of the phosphoric acid in bone-meal. An examination of the results of experiments with bone-meal compared with other phosphates showed that

in by far the greater number of experiments sandy soils, or, at any rate, soils poor in humus, had been used. The phosphoric acid in bone-meal, however, is best employed by plants in soils rich in humus, a fact which is usually explained by the statement that the acid properties of the humus make bone-meal more easily available. This explanation is not altogether satisfactory, as there are several reasons for supposing that one is dealing here with a somewhat more complicated process than the simple one of making soluble a substance insoluble in water, in a way similar to that which occurs in treating basic slag with a 2 per cent. solution of citric acid.

A higher proportion of humus, it must be remembered, implies an entire modification both of the physical as well as of the chemical properties of the soil; for example, in a soil rich in humus, the nutrient plant materials, as well as other substances, exist in different proportions, and particularly in other combinations than is the case in a soil poor in humus. This applies in the first place to nitrogen. Whilst in artificially manured soils poor in humus nitrogen occurs largely in one form, most frequently in the form of nitrate, the soils rich in humus contain their nitrogen partly as nitrate, partly as ammonia, and partly as organic combinations of various kinds. It is not altogether unlikely that the form in which nitrogen is present in the soil, as well as the more or less acid reaction of humus, may influence the availability of the phosphoric acid in bone-meal. Some experiments by Prianischnikow are referred to as bearing on this point, in which it was shown that sulphate of ammonia when partially substituted for nitrate of soda acted very favourably when used with raw mineral phosphate, and gave results equal to those obtained from superphosphate and nitrate of soda. When the nitrate of soda was replaced by nitrate of ammonia, similar results were obtained, and the latter was found to be equivalent to a mixture of nitrate of soda and sulphate of ammonia. If, however, the nitrate of soda were entirely replaced by sulphate of ammonia, an opposite effect, curiously enough, occurred, and the development of the plants under experiment was seriously retarded. These experiments were all made in combination with mineral phosphate. When an easily soluble phosphate,

such as superphosphate, was added, the mixed nitrate of soda and sulphate of ammonia manure was found to act somewhat differently, and indicated that the addition of nitrogen, in the form of ammonia, resulted in a proportionately decreased yield.

It seemed from this that the simultaneous presence of two or more different forms of nitrogen was advantageous in enabling certain phosphates, namely, those difficult of assimilation, to produce their full effect, and Professor Söderbaum's experiments show that bone-meal, in the presence of salts of ammonia or organic combinations of nitrogen, yielded, without exception, larger crops than when the nitrogenous manures consisted exclusively of nitrate of soda. This was found to be also the case with Algerian phosphate and precipitated tricalcic phosphate.

This increased yield occurred both with mixed manures of nitrate of soda and sulphate of ammonia, and also with ammonia alone. Indeed, in the latter case the crop reached its maximum.

The yield of grain was increased throughout to a greater extent than that of straw, particularly in those cases where the manuring was carried out with organic combinations of nitrogen.

The increased crop produced by the addition of ammonia varied, within fairly wide limits, from year to year, according to the various meteorological conditions.

In favourable cases the total crop after bone-meal was more than doubled, and the grain crop nearly trebled.

With superphosphate, basic slag, and precipitated dicalcic phosphate, the employment of ammonia led to no increased yield; rather, in individual instances, to an unimportant diminution in the crop.

When employed on soils free from large quantities of lime, bone-meal may be expected to have as great an effect in respect to its phosphoric acid as superphosphate, provided that salts of ammonia are present at the same time.

It may be pointed out that the above results exclusively refer to the experimental conditions; whether and to what extent they are of general application will form the subject of further experiments.—(*Deutsche Landw. Presse*, Jan., 1906.)

Regulations for the Prevention of Dodder in France.

In 1904 the cultivation of lucerne and clover in France was much affected by the prevalence of dodder, particularly in a number of the Southern Departments. The Minister for Agriculture addressed a circular letter, dated 14th October, 1904, to the Préfets of Departments in which it was mentioned that, although it was not difficult for seed merchants to remove by careful cleaning the native clover dodder from the seeds of clover and lucerne, the fact remained that at least one-half of the clover and lucerne seed sold in France still contained dodder. Moreover, a new danger had arisen from the importation of several species of American dodder with seeds of American origin, particularly the variety known as *Cuscuta gronovii*, Willd. These American dodders appeared to thrive in France at least as well as the native dodder, while, owing to the size of their seeds, the cleaning was rendered much more difficult, the most perfect machines failing to remove the dodder completely even at the cost of considerable waste. In these circumstances it was considered desirable to take some organised action against the spread of the parasite, and the Préfets were invited to take advantage of a law of 24th December, 1888, under which they are authorised to prescribe measures against insects, fungi, &c., injurious to agriculture. The method suggested was that farmers should be required to undertake the destruction of dodder wherever it appeared on their farms by digging under and burying the crop attacked, and, after thoroughly turning and breaking up the land, sowing some gramineous crop on which dodder is unable to live: for example, after clover, Italian rye-grass or oats. If, however, the dodder had already commenced to form seed, the crop attacked was to be gathered, cutting it as low down as possible, and then burnt. Regulations in this sense have accordingly been made in various Departments of France.

Poisoning of Cattle by "Java" Beans.

Several cases of poisoning among cattle occurred in Scotland towards the end of last year, the cause of which was not at first very readily identified, though suspicion rested on the pea or bean meal with which the animals had been fed. On the attention of the Board being directed to the matter, the sug-

gestion was made that the poisoning might possibly be due to the meal being made from the beans of *Phaseolus lunatus*, the poisonous properties of which had been investigated at the Imperial Institute in 1902 and 1903,* and had formed the subject of a short note in this *Journal* in December, 1902 (Vol. IX., p. 373). On analysis this was found to be the case, the presence in the meal of a glucoside yielding hydrocyanic acid being ascertained.

The Board instructed one of their inspectors to investigate the matter, and from his report it appears that no less than seven cases occurred in Scotland and one in England in which death or illness among cattle has been attributed to the poisonous properties of the beans in question, known in this case as "Java" beans. The serious losses which have been incurred by the farmers and dairymen affected may be gathered from the following notes :—*Case A :* Bean meal given to thirteen cows, with the result that two died and several others were alleged to be suffering from the effects a month later. *Case B :* Two cows ate the bean meal and both died. *Case C:* Thirty-two cows were fed with the meal in this instance and twenty-six of them died. In this case about $3\frac{1}{4}$ lb. of the meal were given to each cow and symptoms of poisoning showed themselves within a few minutes after feeding. Most of the cows died within an hour or so after being attacked. *Case D:* Here a mixture of four bushels of ground maize, four bushels of the beans, and twenty bushels of crushed oats was employed, and on being fed to twenty-six cows resulted in the death of eight and injurious effects to the whole of the remaining animals in the herd. *Case E :* In this instance, four tons of beans invoiced as "Java beans" were purchased, ground locally, and fed to thirty-five dairy cows towards the end of March, 1905. The first time the cattle got the meal only a very small portion was given, merely a handful or two, together with other concentrated food, and chopped scalded hay. One cow showed symptoms of illness but recovered. She had newly calved, and was drenched for what were supposed to be milk-fever symptoms. On the second occasion, however, when about $1-1\frac{1}{2}$ lb. of the meal was given to each beast, together with the same quantities of crushed oats

* *Bulletin* of the Imperial Institute, 1903, Vol. I., pp. 15 and 112.

and barley meal, the whole herd became violently ill, but subsequently recovered, with the exception of four cows and a bull, which died very shortly after eating their portions. *Case F:* Here no fatal results occurred, though one or two cows were taken ill. *Case G:* In November, 1905, bean meal was given to a herd of about twenty-five dairy cows, all the cows receiving about 3 lb. each; every beast was attacked and prostrated, one death occurring. On the following day, having recovered, they were again fed with the meal, when all were seized with illness, but, fortunately, on this occasion no death occurred.

In the seven cases which occurred in Scotland the beans were all traced to one firm in Glasgow, though the ultimate source from which they were derived was not ascertained.

They were, however, in the majority of cases, invoiced and described by the sellers as "Java" beans, and a sample of the beans said to have been used in preparing the meal used in one of the cases above mentioned (*Case C*) was sent to the Imperial Institute and identified as undoubtedly the beans of *Phaseolus lunatus*, having all the appearance of these beans as recently imported from Java. The poisonous nature of the uncultivated forms of the beans of *P. lunatus* has formed the subject of investigation at the Imperial Institute, and the following extracts from the current number of the *Bulletin* (Vol. III., No. 4) summarize the available information:—

"The scientific aspect of the question is fully discussed in a paper communicated by Professor Dunstan and Dr. Henry to the Royal Society, and published in the *Proceedings of the Royal Society for* 1903, in which it is shown that the prussic acid is formed from a glucoside, contained in varying amount in the bean.

"It was also pointed out that the beans imported into this country from the East Indies as a cattle food under the names of 'Rangoon,' 'Paigya,' or 'Burma' beans, are derived from cultivated forms of *Phaseolus lunatus*, and that whilst some of these (the white beans) yield no prussic acid, others (the pink beans with small purple spots) yield traces of the acid usually too small to be harmful.

"At the same time, the danger of using the coloured beans of *Phaseolus lunatus* as a feeding stuff was pointed out, and in

particular it was indicated that changed climatic or cultural conditions in any locality in which the cultivated forms of the bean are produced, might lead in some cases to the production of poisonous forms, and that, further, there was some difficulty in distinguishing by mere inspection between the poisonous wild beans, and the coloured forms produced by more or less careful cultivation, and that consequently if a large trade in these beans were developed, as seemed probable, there would always be risk of confusion between the poisonous and non-poisonous forms.

"It appears that this latter difficulty has already arisen, both in this country and in Holland. Quite recently the Imperial Institute has received from three different firms of importers in this country, samples of beans of *Phaseolus lunatus* said to be imported from Java. These beans had seed coats exhibiting the dark purple, or buff colours with purple spots, which seem to characterise the poisonous variety of the beans of *Phaseolus lunatus*. The samples were examined in the Scientific and Technical Department of the Imperial Institute, and found to yield quantities of prussic acid varying from 0·03 to 0·16 per cent. These quantities of acid are about the same as those furnished by the wild Mauritius beans derived from *Phaseolus lunatus* previously examined at the Imperial Institute which are well known to be poisonous. These results were communicated to the firms importing these beans from Java, and fortunately it was possible in a number of cases to prevent the sale of further consignments in this country. The beans seem to have been imported, however, in comparatively large quantities, and through a number of different firms, and it has consequently been impossible for all the importers to be warned, with the result that a number of poisoning cases among cattle have occurred.

"The same trouble seems to have arisen in Holland. The Imperial Institute has been informed by the Director of the Kolonial Museum at Haarlem that several cases of poisoning both among cattle and human beings have been traced to the consumption of these beans.

"A distinction must be drawn between these highly toxic beans as produced in Java and Mauritius by *Phaseolus lunatus* when growing wild or in a state of partial cultivation, and those

produced in India and elsewhere and obtained from the same plants in a state of more or less careful cultivation and imported as 'Rangoon' or 'Burma' beans. The Indian beans obtained from *Phaseolus lunatus* occur in two forms: (1) quite white and (2) pink with purple spots. Both these Indian forms have been examined at the Imperial Institute, and the former have been found not to yield any prussic acid, whilst the pink beans marked with purple spots have yielded only traces of the acid and may not be harmful.

"The white cultivated beans are also produced in Java, and they have been examined by Dr. Treub, of Buitenzorg, who has informed the Director of the Imperial Institute that he has obtained no prussic acid from them. Samples of white *Phaseolus lunatus* beans, probably of South American origin, purchased in France, have also been examined at the Imperial Institute and found to yield no prussic acid. It seems probable, therefore, that the white beans yielded by the carefully-cultivated variety of *Phaseolus lunatus* are quite harmless, and so long as trade in this product is confined to this form there seems to be no risk of danger. With regard to the other Indian form with a pink seed coat, marked with purple spots, it is probable that this does not usually yield sufficient prussic acid to be harmful, and the dangers in using it lie in the possibility of more than the usual amount of prussic acid being developed owing to unusual climatic or cultural conditions, and in the chance of the toxic uncultivated forms of the bean being mistaken for this variety and sold in place of it."

In view of the above conclusions, the Board think that farmers, dairymen, &c., should exercise great caution before using meal made from any but the white form of these beans, while millers, dealers, and middlemen generally should be very careful to see that the beans or bean meal sold by them do not possess any poisonous qualities.

It may be pointed out that the sale of beans or bean meal possessing poisonous or injurious properties may not only result in the seller being compelled to recoup the purchaser any loss incurred by the consumption of the stuff, but the seller will also be liable to be prosecuted under the Fertilisers and Feeding Stuffs Act, 1893.

Report on Tuberculosis in Pigs in London.

A report has recently been presented by Dr. G. S. Buchanan to the Local Government Board on administration in London with regard to meat of pigs affected by tuberculosis.

The object of this inquiry was to ascertain what data were available regarding the existence of tuberculosis in pigs the meat of which is sold in London as fresh pork or used in various preparations of pork; what action is at present taken by the public authorities concerned and by their officers for the detection of tuberculosis in the carcases or viscera of such pigs; to what extent such action may be relied upon for the detection of tuberculosis in the pig either by examination at the place of slaughter or by subsequent examination of the dressed carcase; and what practice, as regards condemnation, official "seizure," and prosecution of offenders is adopted by the different authorities concerned when dealing with meat derived from pigs which have been affected by tuberculosis.

The report deals with the prevalence, causation, and prevention of tuberculosis in pigs; the appearances and detection of tuberculous lesions in pigs; the use for food of meat from tuberculous pigs; the origin of pigs whose meat is sold in London as fresh pork or used in various preparations of pork; and the method of meat inspection in London, together with some account of the official inspection to which pigs are subject in Holland, Denmark, United States, and elsewhere.

The information thus brought together indicates as regards London the incompleteness and lack of uniformity in the measures adopted by public authorities to control or prevent the importation, sale, or use for manufacture of meat of tuberculous pigs.

Dr. Buchanan points out that the need for greater uniformity is appreciated by those engaged in the pork trade, whether farmers, middlemen, or retail butchers, and has been insisted upon in representations made on behalf of the trade to Government Departments and local authorities. Underlying these representations, however, there has often been a more or less tacit assumption that the risk to man arising from eating the meat of pigs which have been affected by tuberculosis is

negligible, with the inference that the greater uniformity of practice desired should be sought by the removal of present checks upon the sale of meat of tuberculous animals in London rather than by alterations which would increase the inspection of meat.

Dr. Buchanan considers that any step in this direction would be undesirable for many reasons, and suggests certain directions in which material progress might be made towards greater uniformity of practice in London.

He suggests that there would be many advantages in extending the system adopted in Dutch and Danish slaughter-houses of attesting the fact that a given carcase together with its viscera has passed official inspection. The official labels which at present are attached to these carcases might usefully be supplemented by stamping or branding the carcase in several places with an appropriate mark, for instance, under German meat inspection regulations, carcases of pigs which have passed official inspection are stamped (on each side of the carcase) on head, neck, shoulder, back, belly, and outside of hind leg. The pig carcase lends itself easily to stamping. Similar marking and labelling could be easily undertaken in the case of pigs slaughtered under official inspection at Islington, when new slaughter-house arrangements are made there.

Such marking would assist meat inspectors both at the Central Market and at retail shops. At the Central Market it would be advisable from time to time to check the system of marking by careful examination of marked carcases. But as a rule attention would be given only to those which were unmarked, and much labour would thereby be saved.

There is no reason to apprehend that marking the carcase (an every day practice on the Continent) will in any way prejudice its sale to the public, and it seems probable that retail butchers and other buyers will appreciate the security afforded by the mark. This has certainly been the case with the labels attached to the officially inspected carcases imported from Holland. The danger appears to be rather the other way, that unequal treatment may be accorded to the home producer who cannot profitably send his pigs alive to Islington and is obliged to slaughter in private slaughter-houses. In the absence of care or knowledge on the part of men who slaughter or dress the

carcase—and many of them are altogether ignorant of the significance of tuberculous lesions—and being without the advantage of official inspection, the home producer may send carcases of tuberculous animals to London with the result that (under the system of marking) they are specially looked over and tuberculosis is discovered. In such cases he would not only lose the value of the carcases, but would be at a disadvantage when compared with the foreign importer in consequence of the risk of prosecution which he would incur.

Dr. Buchanan refers in this connection to the scheme for systematic meat inspection in London which was prepared in 1898 by the Medical Officer of Health of the London County Council (Annual Report, 1898, Appendix II.). One of the most valuable parts of this scheme was the provision at some half-dozen or more points selected with regard to railway and road traffic of "meat inspection stations." The object of these stations was to receive all butchers' meat consigned direct to London tradesmen or manufacturers and not going through the Central Meat Market. It was proposed that the carcases should there be examined, under satisfactory conditions and regulations, by veterinary inspectors with special training or experience in the inspection of meat. Convenient places for cold storage were to be attached to these inspection stations. In this report Sir S. Murphy gave reasons for believing that the cost of providing and maintaining these stations, which in part would be defrayed by inspection fees, would be comparatively small.

Establishment of such inspection stations, together with marking of meat there inspected, would go far to remove the disadvantage to the home producer referred to above, and to enable carcases of tuberculous pigs to be dealt with on uniform lines throughout the Metropolis. A further part of this scheme was that together with these inspection stations, or at certain of them, public slaughter-houses should be provided, with the intention of enabling steps to be taken to close the various private slaughter-houses which remain in London. The proportion of pork in London which comes from private slaughter-houses in the Metropolis is comparatively small, but if these public slaughter-houses were established, or if meat prepared at private slaughter-houses in London were required to be submitted to examination at the inspecting stations or

otherwise, opportunity would be afforded for proper examination of pigs killed at these establishments.

Dr. Buchanan also mentions the question of dealing with condemned meat so as to permit its utilization for human food. Suitable treatment, by way of special cooking or sterilizing would enable a large proportion of such condemned meat to be used for food, and although the product would necessarily be sold at a cheap price, some return could be made to the owner of the condemned carcase.

Live Stock Import Regulations.—Tasmania.*

According to the Diseased Animals Importation Prevention Act, dated September 9th, 1898, all animals intended to be imported into Tasmania, other than from Australia, New Zealand, and part of Africa, must be shipped at the port of London. No animal shall be landed in Tasmania at any place other than the Quarantine Grounds, Middle Island, River Tamar, or Nubeena, River Derwent.

Notice and Declarations.—Every person desiring to introduce any animal into Tasmania shall give six weeks' previous notice in writing to the Chief Inspector of Sheep at Hobart, giving particulars of the description, number and brands (if any) of the animals intended to be introduced ; the place whence, and the time when, they were shipped ; and the name of the vessel by which they are expected to be conveyed.

The health of such animals shall be authenticated by the declarations mentioned below, which are to be forwarded to the Chief Inspector at Hobart within twenty-four hours of their arrival in Tasmania :—

(*a*) A declaration by the breeder or owner that the animal was at the time of shipment, and had been for the preceding sixty days, free from infection, and had not during such period been in contact with, or feeding on the same land with, any animal infected with disease ; and that it was not conveyed to the port of shipment in any vehicle, or, if so conveyed, that such vehicle had, before conveying such animal, been washed and disinfected.

* Live stock import regulations have been published in this *Journal* for the following countries :—United States, June, 1903, and Oct., 1904 ; Argentina, Jan., 1905 ; Cape Colony, Feb., 1905 ; Canada, March, 1905 ; New South Wales, April, 1905 ; Germany, May, 1905 ; New Zealand, June, 1905 ; South Australia, July, 1905 ; France, August, 1905 ; Belgium, Sept., 1905 ; Uruguay, Oct., 1905 ; Victoria, Nov., 1905 ; Spain, Dec., 1905 ; Queensland, Jan., 1906 ; and Western Australia, Feb., 1906.

In the case of horses and cattle the certificate must also state that before being shipped they had been respectively tested with mallein or with tuberculin. This declaration is to be made before a Justice of the Peace not more than three days before the date of the declaration (*b*) of the veterinary surgeon.

(*b*) A declaration by a veterinary surgeon, who must be a Member of the Royal College of Veterinary Surgeons, stating : (1) that he has examined the animals shipped, and all other animals shipped on the same vessel, either for export or for the use of passengers and crew ; (2) that the horses and cattle before being shipped had been respectively tested with mallein or with tuberculin ; and (3) that, to the best of his knowledge and belief, none of them were then, or were likely to be, infected with any infectious or contagious disease. Such declaration shall be made before a Justice of the Peace at the port of embarkation.

(*c*) A declaration in a prescribed form by the captain or master of the vessel conveying the animals.

On arrival, all animals on board shall be examined by an inspector, and also by a duly qualified veterinary surgeon.

Quarantine.—All animals permitted to be landed by an inspector shall be removed by the owner to a quarantine ground and detained there for the following periods : horses for not less than fourteen days ; cattle for not less than sixty days ; sheep for not less than thirty days ; and swine for not less than sixty days. All sheep shall be washed, dipped, or disinfected in such manner as the Chief Inspector of Sheep shall direct.

Animals before being removed from a quarantine ground shall be examined by a duly qualified veterinary surgeon and an inspector, and certified by them to be free from disease.

All animals found to be infected with any disease are to be destroyed, and no compensation or claim will be allowed for any animal, fodder, &c., sold or destroyed under these Orders and Regulations.

All expenses in connection with the quarantine, destruction or disinfection of animals shall be paid by the owner.

All fodder required for any animals while in quarantine shall be provided by the owner, who shall, for any horses, cattle, sheep, or swine placed in quarantine, be liable to pay to the Government the sum of £3 3s. per head in the case of horses and cattle, and £2 2s. per head in the case of sheep and swine, towards the expense incurred.

Imports of Milk and Cream in 1905.

The quantity of milk and cream imported into the United Kingdom from abroad in 1905 was less than in any year since 1899. The value per cwt., however, rose considerably, but this was due in the main to the larger proportion of cream in the total imports, and also to the great falling off in imports of cheap preserved milk from France. The cream, which is worth ten times as much per cwt. as fresh milk, last year amounted to 58 per cent. of the total imports, whereas in 1903 it formed under 33 per cent.

The following statement shows the receipts of milk and cream during the past seven years :—

Year.	Quantity.	Value.	Average per Cwt.
	Cwt.	£	s. d.
1899	7,859	16,068	40 11
1900	15,638	26,837	34 4
1901	24,293	42,327	34 10
1902	22,030	37,613	34 2
1903	22,487	41,176	36 7
1904	12,911	29,437	45 7
1905	8,557	23,834	55 8

Fresh Milk.—Of this item only 238 cwt. were received in 1905, as compared with 866 cwt. in 1904. Practically the whole of it came from France. The decline is apparently due to none having been imported in the early months of 1905, at the period corresponding to the bulk of the imports in 1904; for the last six months of the year the imports were 208 cwt. in 1905, as compared with 173 cwt. in 1904. The average value per cwt. works out at 8s. 9d., or 1s. 2d. less than last year.

Cream.—The decrease in this, viz., 1,343 cwt., was not, relatively, so great as that in fresh milk. There was some change in the source of supply, the quantity from France diminishing by some 25 per cent., while that from Norway increased by nearly 40 per cent. The quantity received from Holland dwindled from 830 to 286 cwt., while the only other countries—aggregating together less than 100 cwt.—were Denmark, Belgium, and Germany. Norwegian cream is of less value than French, and in spite of a rise of about 6s. per cwt., in Norwegian cream, its increasing importance is responsible for

the trifling fall in the value of all cream imported from 80s. 1d. per cwt. to 79s. 10d. last year.

Preserved Milk.—Preserved milk, other than condensed, decreased by 2,383 cwt., the decrease being entirely attributable to France, which sent only a third of its 1904 total. Germany and Holland made no advance, and the increase in Belgium is due to one apparently exceptional consignment in March. The United States and Australia practically dropped out of this trade, but some consignments were received for the first time from Austria-Hungary. Owing to the partial elimination of the very cheap French preserved milk, the value per cwt. rose from 12s. 10d. in 1904 to 22s. 10d. last year.

The Progress of the Sussex Chicken Industry.

The following observations in regard to the Sussex chicken industry have been communicated to the Board by Mr. J. W. Hurst of Uckfield :—It is rather remarkable in an age of what are termed "up-to-date poultry plants," in which all kinds of scientific appliances are employed, that a branch of the industry which shows increasing vitality should be one in which the methods are as old as those of the others are new. The home and centre of chicken fattening is, as is well known, in East Sussex. It is in this district that poultry production is carried on more profitably than perhaps in any other; and this with no expensive plant, with no show or advertisement, and by no highly cultured class, but by old-world methods, carried out by an old-fashioned people, mostly illiterate. Yet these people, with their ancient methods, are making a living, are adding to their stock, increasing their output, and multiplying their establishments.

The chicken industry of Sussex is carried on primarily by small holders, who do not claim to be "poultry farmers," as the term is popularly used; but who are, in fact, the most practical farmers of fowls, and are none the less so because their holdings necessarily carry four-legged stock in addition to the feathered.

The official records and statistics of the Sussex industry are

embodied in a report made in June, 1894, by Mr. R. H. Rew to the Royal Commission on Agriculture. The area mapped out for the inquiry twelve years ago still holds good. It was then noted that the rearing of the chickens brought into the Heathfield District to be fattened extended over a considerable part of Sussex and into the borders of Kent and Surrey, the trade lying within an easy radius of Heathfield and Uckfield railway stations. The fattening establishments have considerably increased in the latter neighbourhood, but there has been no very material expansion of the local rearing limits, the increased output of the finished article (the fattened fowl) being principally provided by additional imports of the raw material (the lean fowl) rather than by local production. The extension of the industry to the western division of the county, which would appear to be the natural tendency, still awaits accomplishment, and while the fatteners of East Sussex are drawing increasing supplies from all available outside sources, the neighbouring farmers of West Sussex apparently fail to realise the opportunities afforded by the demand in the adjacent districts.

At the date of Mr. Rew's report the annual output of fattened fowls from Heathfield and Uckfield stations was 1,840 tons (estimated to represent 1,030,400 chickens). According to the information placed at my disposal by the Railway Company and the local carriers, the output has now increased by some 360 tons per annum. In other words, the fatteners of East Sussex are fattening over 200,000 chickens more per annum now than twelve years ago. As an indication of the increased imports from Ireland of lean chickens, it may be mentioned that during 1893 there arrived at Heathfield station 1,014 "tops" or crates full; but that in the one month of March, 1904, no less than 863 "tops" were received. During the same period the trade in lean birds with Wales and many English counties has been very considerably increased.

Prices have been slightly, but perceptibly, lower, a result probably traceable to the cheapening of first-class goods owing to increased imports from abroad of cheap second and third-grade foreign fowls. Even under present conditions, however, and at prices recently ruling, there is a reasonable margin of profit.

The standardization of the local breed as "Sussex fowls" has given the breeders a fresh asset, and one of which they are taking advantage in increasing numbers. In very many Sussex farmyards, however, there are to be found good specimens of the old Sussex breed, which, with a little more care in selection and mating, would produce a fair percentage of typical stock birds. These could be sold at enhanced values, without any interference with the normal supply of suitable birds for the fattening coops.

Without being unduly optimistic, the record of steady progress is at least satisfactory, and there is every reason to believe that the industry will bear further extension around its present limits and upon its own lines. It is, however, doubtful whether the Sussex industry will bear imitation in other districts without considerable modifications, both as regards methods and prices. The existing industry meets the steady demand of a particular class of consumer in the Metropolis, but there are, as yet, very few other markets prepared to pay prices sufficiently remunerative. As a matter of fact, a fattened fowl at a fair price is more economical for the consumer than a cheap lean one ; but where consumers fail to realise this, producers who seek to educate them would probably lose money.

Eelworms in Mushrooms.

A case is reported* of the total destruction of a large crop of mushrooms by eelworms very similar to, if not identical with, the eelworm † (*Tylenchus devastatrix*) which causes serious injury to clover, wheat, oats, onions and many other plants. In the instance mentioned these eelworms were swarming in the embryo mushrooms, and also in the mycelium just below them ; but they were most numerous immediately below the tiny "buttons," and at this point they had completely arrested the growth of the young mushrooms. Decay had set in, giving the internal tissues a brownish appearance, varying in intensity according to the degree or age of the attack.

The remedy suggested is to clear out the beds at once and

* Journal of the Inst. of Commercial Research in the Tropics, Liverpool University. January, 1906.

† Leaflet No. 46.

give the walls, fixtures and floor a good dressing with a solution of commercial carbolic acid, and finally to apply a dressing of hot lime. Soil should be got from a fresh locality, and care should be taken that it has not been covered by vegetation for some time ; but if it is obligatory to use turf-covered soil it would be well to heat it (not burn it), or spread it out into a thin layer and pour boiling water over it. A method of sterilizing soil is mentioned in this *Journal*, Sept., 1905, p. 357.

Drying or Evaporating Fruit.*

The advantages of fruit drying, fruit pulping, &c., as means of preserving surplus fruit, have been at different times urged on the British fruit-grower, and recently the Council of the Royal Horticultural Society commissioned their assistant secretary, Mr. Thomas E. Sedgwick, to proceed to Germany to study the methods of fruit preserving there, and to see how far the German methods might be applicable to English conditions. Mr. Sedgwick's interesting report† deals with several forms of fruit preserving, such as drying, bottling, &c., in Germany, and also in the United States.

With regard to fruit drying or evaporating, he remarks that although the preservation of fruit by the removal of its watery contents has long been practised in Germany, modern methods of fruit drying were first introduced from America some twenty-five years ago. By the newer methods only so much water is removed from the fruit by drying as is absolutely necessary to its keeping, thus producing good flavour, while a larger proportion of dried to fresh product is obtained. The machine commonly used for this purpose in large factories was invented by Dr. Ryder, an American, but is now manufactured and largely used in Germany. It consists of a self-contained stove from which heated air passes through a long barrel-like container in which are placed a series of trays, the sides of which are of wood and the bottoms of galvanised wire. As the trays are filled with the prepared fruit they are inserted in the racks

* For previous articles on fruit preservation, see *Journal*, Vol. II., p. 257, Dec., 1895; Vol. VIII., p. 61, June, 1901; Vol. XI., p. 621, Jan., 1905; Vol. XII., p. 112, May, 1905.

† *Journal of the Royal Horticultural Society*, Vol. XXIX., part 4.

inside the barrel, and the fruit is gradually evaporated as the current of hot air carries off the essential moisture. An improved form of this kind of apparatus is that known as the Rössler, in which a circulating fan is placed in the end of the barrel furthest from the stove, and when the case is closed the action of the fan keeps the air in motion.

A second form of drying machine was invented and perfected at the German School of Horticulture at Geisenheim. This apparatus is more suitable for smaller businesses and may be moved from one portion of a farm to another. It consists of a stove in which the heat can be regulated in the ordinary way. Above this is placed a metal rack containing thirteen trays similar to those mentioned above, or, if desired, inner trays can be inserted in these, so as to enable the machine to take nearly double the quantity of the prepared fruit. By a simple rachet arrangement operated by a lever the trays can be raised from the bottom, or if it be desired to inspect the contents of any particular tray those above it can be raised in the same manner, thus allowing the tray to be withdrawn and replaced by one containing fresh fruit. By these means the one machine can be kept in constant use. The evaporation in this form of machine also is secured by the heated air passing through the trays and carrying with it the moisture of the fruit. These machines will take from 100 to 180 lb. of fruit, or, if the inner trays be inserted, they will take from 270 to 280 lb.

For household use another machine on very similar lines has been invented, which is placed over the oven in the kitchen range, thus utilizing the waste heat without additional expense for fuel.

Whilst drying does not improve the value of fruit, it is of service in preventing waste and in rendering a glut of the summer or autumn a saleable product in winter with the expenditure of a little capital and some trouble. Another consideration which is not sufficiently recognized is that the evaporation of the moisture renders the fruit or other material more portable and capable of being packed in a very small compass, and that the evaporated moisture can be replaced and the fruit restored to very much its original appearance by soaking for some hours in water. It should always be cooked in the same water.

The fruit most generally met with in a dried state is undoubtedly the apple. A firm flesh, adaptability for the paring machine, a relatively high proportion of dried product to the fresh fruit, a small percentage of water whereby the duration of the drying and consequently the cost are much reduced, a small core, and a good shape are the principal points to notice in selecting apples for drying.

Great care should also be taken to obtain apples of the right degree of ripeness. Under-ripe and over-ripe fruits are equally unsuitable, but with a little care the exact grade in each variety treated can be easily observed.

The apples are cored, pared, and sometimes cut into rings. The thinner the rings are the quicker they dry, and the lighter their colour when dry the better they sell. The prepared apples are kept in a vessel of perfectly clean water containing a small quantity of salt until they are put in the dryer, which prevents oxidation and discolouration.

The fruits are laid on the wire-bottomed trays of the dryer, placed in the machine, and the temperature regulated to 180–210° F. Then, if a higher temperature, namely, 240° F., be used, with a strong current of air, the product is dryer, more nourishing, and keeps better, but the flavour is quite changed. The time occupied varies from two to four hours, according to the variety of the apple, but from two to two and a-half hours is the usual time. Whole apples require a much longer time—eight to ten hours, according to size and variety.

After the evaporation of the water in which it was held suspended, the whole of the "pectin" or fruit gluten remains unchanged in the cells, and is visible in a condensed form on the outside of the fruit, and all germs and ferment are destroyed by the heat. The waste matter (core, &c.) in apples varies from 25 to 33 per cent., and the finished product weighs from 11 to 14 per cent. of the fresh fruit. The proportion of water removed from the fresh fruit, and the concentration and also formation of sugar in well-dried fruits, are given by Dr. König, after careful analysis, as follows:—Fresh apples contain on an average besides other matter 83·58 per cent. of water and 7·73 per cent. sugar; dried apples yield, however, 27·95 per cent. water and 42·83 per cent. sugar. The relatively high percentage

of water in dried fruit is, however, due to the fact that they re-absorb a certain quantity of water from the atmosphere when they have been rendered very dry.

Pears are best treated when half-ripe, as they thus dry easiest and produce the largest quantity of the prepared product. Fully ripe pears, which are consequently very full of juice, dry slowly and with difficulty. Most varieties of dessert pears are not suited for drying, and cooking pears yield the best result. To produce a very fine product, the pears are thrown into spring water when peeled, quartered, and the core removed, and then steamed at a high temperature for eight to ten minutes. The original moisture of the fruit is thus more easily evaporated. Whole pears require seven to nine hours, halved and quartered five to seven hours.

The best varieties of plums for drying are those of which the fruit is large, with a good percentage of sugar and rich in aroma. Other varieties are not so suitable for the purpose on account of their acidity, and give an unattractive brown product. Mirabelles dry in six to eight hours, and both look and cook well; 30 lb. of dried fruit can be got from 100 lb. of the fresh. Plums should never be dried too much, as they then lose much of their aroma, and the final product is of less weight. The large egg-shaped plums should be steamed for about six minutes before drying, which should then occupy eight to twelve hours.

Miscellaneous Notes.

Soil Inoculation.—In connection with the previous articles which have appeared in this *Journal** on the subject of soil inoculation, it is interesting to notice that the United States Department of Agriculture state in a recent publication† that the method of distributing practically pure cultures of nitrogen-fixing bacteria dried on cotton has not proved entirely satisfactory, owing to varying conditions of air during transit and to certain matters connected with laboratory technique. Investigations have been proceeding for some time with a view to improving the methods followed, and as a result the Depart-

* *Journal*, Vol. XI., p. 348, Sept., 1904; p. 669, Feb., 1905; p. 725, March, 1905; and Vol. XII., p. 282, Aug., 1905; p. 641, Feb., 1906.

† *Farmers' Bulletin*, No. 240.

ment is now prepared to send out bacteriologically pure cultures in small tubes hermetically sealed.

Lagos Agricultural Show.—An Agricultural Show will be held in Lagos, West Africa, in November, 1906, under the auspices of the Lagos Government.

A leading feature of the show will be the sections for implements and machinery suitable for either the cultivation of tropical produce or for its preparation for the European markets, and for local consumption.

Application should be made to the Colonial Secretary, Lagos, or to the Commercial Intelligence Officer for Lagos and Southern Nigeria, care of the Crown Agents for the Colonies, Whitehall Gardens, London, S.W.

Exhibition at Bucharest.—With reference to the note as to this Exhibition in the *Journal* for January last (p. 632), the British Consul-General is now informed that the concession for the International Pavilion for Foreign Exhibits has been given to Monsieur Erlich, Poste Restante, Brussels, and that intending exhibitors should address themselves to him for conditions, &c.

Horse-Breeding in Japan.—According to the Yokohama Chamber of Commerce Monthly Report, the Japanese Government contemplates establishing a Remount Bureau, and detailed plans have been drawn up, the gist of which is that horse-breeding is to be modelled after that obtaining in certain foreign countries. Seventeen years is reckoned as the period required within which to effect the desired change, and it will require a sum of 20,000,000 yen (about £2,040,000). It is intended to have one million and a-half horses throughout the country at the end of the prescribed period, every one of which will be from foreign stock, especially from Austro-Hungarian breeds. Every year a certain number of stallions are to be imported for the purpose, and the number of breeding stations increased in proportion.

*Agricultural Exhibition at Rostov-on-Don.**—The Board have received from the Foreign Office a memorandum from Consul Medhurst, in which he states that the Rostov-on-Don Agricultural Exhibition was started in 1896. Though originally intended to be exclusively a live stock exhibition, it was decided

* A note as to British breeding stock exhibited at the Kharkov Exhibition appeared in this *Journal*, August, 1904, p. 292.

in 1902 to admit agricultural machinery, and this has been shown for the last three years—chiefly by Russian makers. As is natural in Cossack territory, which supplies such a vast quantity of mounts for the Russian Army, horses are the most important feature of the show. Persistent efforts have been made to improve the small native breed by crossing with Arab and English thoroughbred blood, and 155 promising young horses were shown at the last exhibition (1905) which were sold for very fair prices, despite the bad state of trade prevailing.

The cattle were mostly fine specimens of the large Ukraine and Calmuck types and half-bred oxen, obtained by crossing the same with Durham and Simmenthal bulls. The idea appears to have been rather to produce strong draught oxen than beef.

The show of sheep was not so good, and with the exception of some fine Shropshires and Hampshires, shown by an English firm, there was nothing worthy of special mention. There were only a few pens of pigs, but some remarkably fine geese were shown, both native and British, and obtained good prices.

The chief exhibits of agricultural machinery were those of steam thrashing sets. One British firm supplied a portable engine. The foreign exhibits were well got up, and the Consul draws attention to the efforts of Austrian and German firms to obtain a share of the important thrashing machine trade hitherto practically a monopoly of British makers. American ploughs, reapers and mowers were shown, while dairy farm utensils from Germany and Sweden attracted attention.

Intending exhibitors should secure the services of a local agent with a knowledge of the language and country.

Price of Sainfoin.—With reference to the article on the "Formation of Permanent Pastures," Professor Middleton states that the price of sainfoin given in the seeds-mixture on p. 461 is incorrect. The present price of giant sainfoin in the husk is just over 2d. and that of English common sainfoin in the husk is over 3d. per lb., so that the cost of the 5 lb. of sainfoin required in the mixture would be from 1s. to 1s. 6d.

Cases for Binding the Annual Volume of the Journal.—These can be obtained from Messrs. Laughton & Co., 3, Wellington Street, London, W.C. Price, 1s. each; by post, 1s. 2d.

ADDITIONS TO LIBRARY DURING FEBRUARY.

Africa—

Natal.—Secretary, Minister of Agriculture. Report for 1904–5. (22 pp.) 1905.

Orange River Colony.—Department of Agriculture. Report for 1904-5. (271 pp.)

Australasia—

The Yearbook of Australia, 1905. (816 pp.)

Tasmania.—Agricultural and Stock Department :—

Bull. 6. Notes on Plant-Attacking Weevils and on Snails and Slugs. (8 pp.) 1905.

Bull. 7. The Poultry Industry in Tasmania. (15 pp.) 1906.

Queensland.—Report upon the Government Central Sugar Mills (36 pp.) 1905.

Belgium—

Tableau Général du Commerce avec les Pays Etrangers, 1904. (711 pp.) 1905.

Canada—

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PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of February, 1906.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 7	7 2	36 3	33 1
Herefords	7 8	7 2	34 7	33 9
Shorthorns	7 5	6 10	35 6	32 6
Devons	7 9	7 0	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¼	7½	8½	7
Sheep :—				
Downs	9¼	8½	—	—
Longwools	9¼	8¼	—	—
Cheviots	9½	9	9	8
Blackfaced	9¼	8¼	8½	7½
Cross-breds	9¼	8½	9	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	7 1	6 8	7 3	6 6
Porkers	7 8	7 3	7 10	6 11
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 0	17 13	21 15	17 9
,, —Calvers ...	20 0	16 13	18 3	16 4
Other breeds—In Milk ...	19 9	14 10	19 12	16 0
,, —Calvers ...	—	12 0	19 3	15 11
Calves for Rearing	2 1	1 13	2 10	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	8 12	7 16	8 16	7 5
,, Two-year-olds	12 17	11 4	14 7	11 19
,, Three-year-olds	15 5	13 13	15 15	13 2
Polled Scots—Two-year-olds	—	—	15 7	13 5
Herefords— ,,	14 1	12 16	—	—
Devons— ,,	11 17	10 6	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	44 10	41 10	—	—
Scotch Cross-breds ...	—	—	36 5	32 3
Store Pigs :—				
Under 4 months	29 0	21 11	24 8	19 5

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 0	49 0	49 6	43 0	55 6*	51 6*
	2nd	49 6	45 0	45 0	41 6	53 0*	46 6*
Cow and Bull ...	1st	—	42 6	42 6	39 0	43 0	39 6
	2nd	—	36 6	38 6	35 6	32 6	33 0
U.S.A. and Canadian :—							
Birkenhead killed	1st	48 6	47 0	46 6	47 0	—	—
	2nd	45 0	42 6	42 6	44 6	—	—
Argentine Frozen—							
Hind Quarters ...	1st	26 6	31 0	29 0	28 0	30 6	29 6
Fore ,, ...	1st	24 0	23 6	22 6	22 0	23 6	23 6
Argentine Chilled—							
Hind Quarters ..	1st	41 0	40 0	39 0	39 0	—	41 0
Fore ,, ...	1st	30 0	31 0	29 6	29 0	—	31 0
American Chilled—							
Hind Quarters ...	1st	54 6	52 0	51 6	50 6	53 0	53 0
Fore ,, ...	1st	34 6	35 6	34 6	34 6	37 0	37 0
VEAL :—							
British	1st	76 0	70 6	74 6	78 6	—	—
	2nd	68 6	57 0	69 6	72 6	—	—
Foreign	1st	81 6	—	—	—	—	74 6
MUTTON :—							
Scotch	1st	72 6	69 0	76 6	76 0	70 6	66 0
	2nd	62 0	58 6	73 0	70 6	59 6	56 0
English	1st	68 6	69 6	73 6	69 0	—	—
	2nd	62 0	56 0	69 0	64 0	—	—
U.S.A. and Canadian—							
Birkenhead killed	1st	—	69 0	—	67 6	—	—
Argentine Frozen ...	1st	31 6	32 0	29 6	30 6	31 0	31 6
Australian ,, ...	1st	29 6	29 6	29 6	29 6	32 0	28 0
New Zealand ,, ...	1st	39 6	40 0	39 6	39 6	32 6	—
LAMB :—							
New Zealand ...	1st	51 6	48 0	43 0	43 0	—	—
Australian	1st	40 0	42 6	37 6	37 6	42 0	39 6
Argentine	1st	36 0	38 6	41 0	39 6	42 0	41 0
PORK :—							
British	1st	67 0	68 6	66 6	67 0	64 0	60 0
	2nd	60 0	60 6	61 0	62 6	62 0	52 0
Foreign	1st	66 0	59 0	57 6	57 6	—	50 6

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (*in* 1906).	Wheat.			Barley.			Oats.		
	1904.	1905.	1906.	1904.	1905.	1906.	1904.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Jan. 6 ...	26 6	30 4	28 4	22 6	24 4	24 6	15 7	16 3	18 2
,, 13 ...	26 11	30 4	28 6	22 3	24 6	24 8	15 9	16 3	18 4
,, 20 ...	27 3	30 5	28 5	22 4	25 0	24 11	15 11	16 5	18 4
,, 27 ...	26 11	30 6	28 7	22 3	25 1	25 1	15 8	16 7	18 7
Feb. 3 ...	26 9	30 6	28 10	22 4	25 0	25 1	15 11	16 7	18 10
,, 10 ...	26 8	30 7	28 10	22 2	25 2	25 3	15 9	16 8	18 10
,, 17 ...	26 11	30 5	28 11	22 7	25 2	25 6	16 0	16 9	19 0
,, 24 ...	27 10	30 10	28 10	22 4	25 0	25 4	16 3	16 10	19 0
Mar. 3 ...	28 8	30 8	28 8	22 6	25 2	25 0	16 5	16 10	19 0
,, 10 ...	29 1	30 9		22 5	25 2		16 8	16 10	
,, 17 ...	28 6	30 10		22 9	24 11		16 7	16 10	
,, 24 ...	28 2	30 9		22 8	25 2		16 7	17 0	
,, 31 ...	27 11	30 9		22 10	25 1		16 6	16 11	
Apl. 7 ...	27 10	30 9		22 5	25 6		16 5	17 0	
,, 14 ...	27 9	30 8		22 6	24 3		16 4	17 6	
,, 21 ...	27 9	30 8		22 0	24 4		16 4	17 5	
,, 28 ...	27 8	30 9		21 1	24 4		16 3	17 9	
May 5 ...	27 4	30 8		20 8	25 3		16 7	18 0	
,, 12 ...	27 1	30 8		19 10	24 10		16 6	18 3	
,, 19 ...	26 9	30 10		20 4	24 8		16 7	18 5	
,, 26 ...	26 9	30 11		19 8	24 4		16 7	18 8	
June 2 ...	26 10	31 3		18 8	23 6		16 8	19 1	
,, 9 ...	26 6	31 4		18 5	24 0		16 10	18 11	
,, 16 ...	26 5	31 7		18 2	26 0		16 8	19 1	
,, 23 ...	26 5	31 7		19 2	23 9		16 10	18 10	
,, 30 ...	26 4	31 8		18 8	23 2		17 1	19 7	
July 7 ...	26 6	32 1		19 8	22 11		17 1	19 6	
,, 14 ...	26 10	32 3		18 9	23 10		17 6	19 7	
,, 21 ...	27 7	32 2		18 10	23 7		17 6	18 11	
,, 28 ...	28 0	32 3		19 9	23 11		17 10	19 3	
Aug. 4 ...	28 3	31 11		19 9	22 0		17 10	18 4	
,, 11 ...	28 4	30 5		19 9	22 5		17 7	16 11	
,, 18 ...	28 8	28 5		22 5	23 4		16 7	16 4	
,, 25 ...	29 5	27 1		23 2	23 6		16 5	15 9	
Sept. 1 ...	30 2	26 11		25 3	23 5		16 3	15 9	
,, 8 ...	30 0	27 1		24 10	23 4		16 1	15 11	
,, 15 ...	29 7	26 11		24 9	23 7		15 11	16 0	
,, 22 ...	29 10	26 8		25 10	23 10		15 9	15 11	
,, 29 ...	29 10	26 9		25 5	24 3		15 8	16 1	
Oct. 6 ...	30 2	26 9		25 6	24 9		15 9	16 3	
,, 13 ...	30 5	26 11		25 4	24 10		15 8	16 6	
,, 20 ...	30 4	27 1		25 5	25 0		15 11	16 7	
,, 27 ...	30 6	27 4		24 11	24 11		15 10	16 8	
Nov. 3 ...	30 6	27 10		25 0	24 9		16 0	17 1	
,, 10 ...	30 3	28 3		24 6	24 10		15 11	17 4	
,, 17 ...	30 2	28 7		24 5	24 6		16 0	17 8	
,, 24 ...	30 5	28 5		24 4	24 6		16 1	17 9	
Dec. 1 ...	30 4	28 8		24 6	24 6		16 2	17 11	
,, 8 ...	30 4	28 6		24 4	24 7		16 2	17 11	
,, 15 ...	30 4	28 5		24 4	24 5		16 2	17 11	
,, 22 ...	30 3	28 4		24 7	24 6		16 1	17 11	
,, 29 ...	30 4	28 3		24 8	24 7		16 2	18 1	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1905.	1906.	1905.	1906.	1905.	1906.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	January ...	39 11	39 10	23 7	25 0	18 5	21 10
	February ...	39 11	40 0	23 8	25 1	18 10	22 1
Paris:	January ...	40 7	39 7	24 0	25 5	19 4	22 6
	February ...	40 3	40 4	24 4	25 2	19 9	22 8
Belgium:	November...	31 4	30 9	22 9	23 7	21 6	20 9
Berlin:	January ...	38 7	39 10	—	—	20 1	22 10
Breslau:	January ...	36 5	35 6	25 7	25 1	19 6	20 7

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of February, 1905 and 1906.

—	Wheat.		Barley.		Oats.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	31 7	29 11	24 6	24 4	17 9	19 5
Norwich	30 6	28 5	24 10	25 2	16 6	18 6
Peterborough ...	29 11	27 11	24 6	24 11	16 4	18 5
Lincoln	29 10	28 8	23 10	25 0	15 11	18 7
Doncaster	29 5	28 6	24 1	25 0	15 9	18 10
Salisbury	30 0	28 10	25 11	26 2	16 6	19 7

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1906.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	15 0	13 9	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	114 0	112 0	—	—	—	—	—	—
Danish ...	117 0	115 0	118 6	116 6	119 0	115 0	117 0	—
Russian ...	105 0	103 0	114 6	112 6	104 0	101 0	107 0	—
Australian ...	105 6	103 6	—	—	108 0	106 0	108 6	104 0
Argentine ...	109 6	107 0	112 6	111 0	108 6	106 6	109 0	—
CHEESE :—								
British, Cheddar	78 0	75 0	—	—	74 0	68 0	68 0	64 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	75 0	67 0	76 6	69 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	64 0	63 0	64 0	62 6	63 6	61 0	64 0	62 0
BACON :—								
Irish	68 0	65 6	66 6	64 0	64 6	61 6	—	—
Canadian ...	58 6	56 0	55 6	52 0	56 6	53 0	57 0	53 6
HAMS :—								
Cumberland ...	102 6	101 0	—	—	—	—	—	—
Irish	106 0	104 0	—	—	—	—	96 0	91 0
American (long cut) ...	50 6	48 0	50 0	48 0	51 0	48 0	52 6	49 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	12 8	10 7	—	—	—	—	—	—
Irish	13 4	11 10	10 9	10 3	10 7	10 1	11 6	10 8
Danish ...	12 9	10 9	11 6	10 6	11 7	10 7	12 6	11 3
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	65 0	55 0	—	—	73 6	63 6	56 0	51 0
Scottish Triumph...	65 0	55 0	58 6	45 6	43 6	38 6	—	—
Up-to-Date ...	68 6	57 6	63 0	54 0	41 6	36 6	45 0	40 0
HAY :—								
Clover... ...	90 0	78 0	88 0	80 6	86 0	65 0	77 6	70 0
Meadow ...	78 0	66 6	76 0	70 0	—	—	73 0	65 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	February.		2 Months Ended February.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	74	40	147	87
Swine Slaughtered as diseased or exposed to infection ...	337	171	647	341
Anthrax:—				
Outbreaks	83	79	156	165
Animals attacked	113	104	203	257
Glanders (including Farcy):—				
Outbreaks	76	83	183	182
Animals attacked	138	163	323	335
Sheep-Scab:—				
Outbreaks	91	204	187	407

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	February.		2 Months Ended February.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	4	11	5	18
Swine Slaughtered as diseased or exposed to infection ...	138	169	152	187
Anthrax:—				
Outbreaks	2	—	2	—
Animals attacked	2	—	2	—
Glanders (including Farcy):—				
Outbreaks	—	4	1	6
Animals attacked	—	8	4	12
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	38	71	100	146

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9. Opening Letters received by Morning Mail.
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MOLASSINE MEAL

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"I have for this last two years used Molassine Meal for pigs, and find it answers well. One lot of 20, which was a most inferior lot of pigs when I bought them, did remarkably well after being fed on Molassine Meal, and paid a good profit when sent to the bacon factory. Others that I have fed on Molassine Meal I have killed myself, and can therefore testify as to the quality of the pork."

Mr. A. KIRK, Butcher, Uppingham, writes:—

"Quite accidentally I bought a bullock of Mr. Mason, of Barrowden, through a friend at Preston. I was surprised and very dissatisfied with my judgment when I put the bullock on the scale, the same weighing very considerably above my outside weight. When Mr. Mason told me that he was a regular user of **Molassine Meal** I admitted that I knew nothing of the real value of **Molassine Meal,** but I accepted the above fact as a direct proof of its worth. I shall therefore be glad if you will send me a quantity of **Molassine Meal** for my own use."

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Vol. XII. PUBLISHED MONTHLY. No. 10.

The Journal
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BOARD OF AGRICULTURE

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LONDON:
PRINTED AND PUBLISHED FOR HIS MAJESTY'S STATIONERY OFFICE
By LAUGHTON & Co., Limited, 3, Wellington Street, Strand, W.C.

MONTHLY.
[PRICE FOURPENCE.]
(By Post, Sixpence.)

VOL. XII. PUBLISHED MONTHLY. No 11.

The Journal

OF THE

BOARD OF AGRICULTURE

FEBRUARY, 1906.

[NEW SERIES.]

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MONTHLY.
[PRICE FOURPENCE.]
(By Post, Sixpence.)

Vol. XII. PUBLISHED MONTHLY. No 12.

The Journal
OF THE
BOARD OF AGRICULTURE

MARCH, 1906.

CONTENTS

LONDON:
PRINTED AND PUBLISHED FOR HIS MAJESTY'S STATIONERY OFFICE
By LAUGHTON & Co., Limited, 3, Wellington Street, Strand, W.C.

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